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VOL. XVIII, No. 1

THE OTTAWA NATURALIST.

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CONTENTS.

	PAGE
1. List of Members of the Ottawa Field-Naturalists' Club....	4
2. The Report of the Council of the Ottawa Field-Naturalists' Club for the year ending March 15th, 1904	7
3. Treasurer's Report for the year 1903-04	12
4. The Canadian Species of Trocholites, by J. F. Whiteaves....	13
5. Mollusca New to the Canadian Fauna	18
6. Warbler Songs and Notes, by Rev. G. Eifrig	19
7. The Evening Grosbeak, by C. J. Young	24
8. Nature Study—No. 12	26

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THE OTTAWA NATURALIST.

VOL. XVIII.

OTTAWA, APRIL, 1904.

No. 1

THE REPORT OF THE COUNCIL OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING 15TH MARCH, 1904.

During the year twenty-one ordinary members and one honorary member were added to the Club. The total membership is now 266, composed of 258 ordinary members and eight corresponding.

SOIRÉES.

All the soirées except the last have been held and have proved interesting and profitable; the attendance being up to the average. The full programme was printed in the March number of *THE NATURALIST*. The first meeting was of special interest, as it was held to celebrate the twenty-fifth anniversary of the founding of the Club. The speakers were all members of the first Council, and each told briefly of some of the many changes that have taken place during the past twenty-five years, and the part the Club has taken in directing and leading scientific thought in the community—a record which fully justifies the Club's right to exist, and one which should command the hearty sympathy and support of all intelligent people.

EXCURSIONS.

Nine sub-excursions were held during the year at which the attendance varied from twenty to two hundred. These excursions were to places in the immediate vicinity of Ottawa and were highly successful. Special attention was given to the forest trees, their mode of growth and the various means of identifying them, especially by the buds. The two general excursions were to Chelsea and Alymer, the former, held the 16th of May, was attended by over three hundred members and friends of the Club,

and altogether was one of the most successful ever held at that beautiful place ; the latter to Aylmer although successful was not so largely attended. These excursions form the most important part of the Club's work. The outings themselves are most healthful and enjoyable, but when to the pleasure of a tramp through the open glade or leafy forest is added an opportunity of observing or learning something of the beauty that abounds in every rock, plant or insect, the outing is doubly beneficial. These excursions give an excellent introduction to Nature Study, about which so much is written at the present time. Full accounts of the localities visited and the work done at these outings have appeared from time to time in THE OTTAWA NATURALIST.

THE OTTAWA NATURALIST.

The seventeenth volume of THE OTTAWA NATURALIST has been completed. It contains twelve numbers of 228 pages with eight plates. The following are some of the papers published in this volume :

Yukon Hepaticæ, by A. W. Evans.

The Nesting of Birds at the Central Experimental Farm, by W. T. Macoun.

Description of a new species of *Matheria* from the Trenton Limestone at Ottawa, by Dr. J. F. Whiteaves.

The Beetles of the Oregon Beach, by H. F. Wickham.

A Red-shouldered Hawk in Captivity, by Roger T. Hedley.

Curiosity of a Hummingbird, by Dr. C. Guillet.

Moose with Elk Antlers, by Rev. Wm. A. Burman.

Description of a species of *Cardioceras* from the Crows Nest Coal Fields, by Dr. J. F. Whiteaves.

Nesting of some Canadian Warblers (3rd paper), by Wm. F. Kells.

Hunting for Caterpillars, by Arthur Gibson.

Petrography of some Igneous Rocks of the Kettle River Mining Division, B.C., by L. P. Silver.

Notes on the Nesting Habits of the Brown Creeper and Hudsonian Chickadee, by L. M. Terrill.

My Pet Crows, by L. H. Smith.

Winter Growth of a Water Lily, by Walter S. Odell.

Notes on some Canadian specimens of "*Lituites undatus*" (2 papers), by Dr. J. F. Whiteaves.

A Robin Story, by Emery Perrin.

The Lower Jaw of *Dryptosaurus incrassatus* (Cope), by Lawrence M. Lambe.

A Weed Worth Growing, by Dr. James Fletcher.

Biological Notes on Canadian species of *Viola*, by Theo. Holm.

Remarks on some Marsh Dwellers, by L. M. Terrill.

A Woman's Visit to a Peat Bog, by Miss M. McKay Scott.

Our Eagles and Ospreys, by Rev. C. J. Young.

President's Address, by W. T. Macoun.

Some Canadian Antennarias, by Edw. L. Greene.

A Night's Collecting for Moths at Meech Lake, by Arthur Gibson.

Besides several short articles, book reviews, etc.

An important series of articles on Nature Study, edited by Dr. J. Fletcher, have been published each month, beginning with May, 1903. They were written by Dr. James Fletcher, D. A. Campbell, Dr. S. B. Sinclair (2 papers), W. A. Dent, A. E. Attwood, Professor W. Lochhead, Dr. G. U. Hay, W. T. Macoun, L. A. DeWolfe, and J. W. Hotson. A large number of copies of each article was printed and distributed to teachers throughout the Dominion. These articles presented Nature Study from various points of view, and have doubtless proved of great value to those interested in the subject. They have proved so popular that a special committee of Council has decided to continue the publishing of these articles.

REPORTS OF BRANCHES.

The Botanical Branch reports as follows :—

"Good work has been done by the Botanical Branch during the past year. Professor J. Macoun, in his official capacity, spent the whole summer in Ottawa and vicinity studying the flora of the district, but especially the fungi for Part VIII of his Catalogue of Canadian Plants. He added over two hundred species to the Ottawa flora. Dr. James Fletcher has continued his studies of violets and has done good work in growing the different species

so that they could be studied at all stages of their growth. Dr. Guillet has continued his phenological observations, and has also made a study of the character of the past two springs as affecting the growth of plants. The studies of Mr. D. A. Campbell in the morphology of plants have also been of much value.

The regular fortnightly meetings of the Botanical Branch held at the homes of the members have proved a great success. These meetings were inaugurated by Dr. James Fletcher, the first one being held at his house on February 5th, 1903. The object of starting them was to keep up and promote an interest in botany among the members, and give an opportunity for the reading of notes and short papers on botanical subjects, and to have a general discussion on any matter which might be brought up by the members. Two meetings were held last year and fourteen this year, making sixteen in all, with an attendance of from ten to thirteen at each meeting. Many interesting subjects were discussed and much information was given. Full reports of nearly all of the meetings have been printed in THE OTTAWA NATURALIST. The following are some of the more important topics discussed. The advisability of sub-dividing the Ottawa district into four areas; What is Nature Study?; Canadian violets; Reasons for the "rosette" arrangements of leaves at the base of some plants at a certain period of their growth; Weeds and the causes that lead to their dispersion; Native plants which compare favorably in appearance and succeed as well as Exotic plants; How to know the edible and poisonous fungi; How to study ferns; Relationship between weather and plant growth—a comparative study of the last two springs; Besides these many other subjects were discussed.

The leaders of the Geological Branch report that no systematic work has been carried on during the past year in the vicinity of Ottawa. Leaders in this branch, however, attended the excursions and assisted as far as possible in explaining the Geological problems presented by the different localities visited. It was noted with pleasure that a larger number than formerly joined the Geological section on these occasions.

The members of the Entomological Branch, although few in number, have been very active during the past year. The regular

fortnightly meetings mentioned in last year's report were kept up during last spring and the present winter. Several interesting papers were read and considerable enthusiasm was engendered among the members of the Club. There has been a renewed activity in collecting and studying the insects of the Ottawa district, and good work has also been done by outside members. Mr. W. Metcalfe has taken up and made good progress in studying the local Hemiptera, many of which have been identified by Mr. Van Duzee. The Rev. G. W. Taylor, of Wellington, B.C., has amassed one of the best reference collections of the Geometridæ of North America, and has rendered great assistance in identifying specimens for collectors. The leaders have all been exceptionally active and large additions have been made to the local lists of insects.

The Ornithological Branch report that the leaders attended the excursions and pointed out the chief characteristics of the birds seen and aided those interested wherever possible, and also that through the help of the Hon. Frank Latchford arrangements have been made for the appointment of a special official to enforce the Provincial Act which prohibits the destruction or trapping of useful birds.

The Treasurer's Report shows a balance on hand of \$39.18.

The thanks of the Council are again heartily extended to Principal White, of the Normal School, for the use of rooms in this building in which we have held all our soirées, and also for the continued use of a room for our library, and Council meetings. The Council again wishes to place on record its obligations to the daily press of this city for publishing notices of our meeting free of charge.

W. J. WILSON,
Secretary.

THE OTTAWA FIELD-NATURALISTS' CLUB.

The Treasurer's Statement for the year ending 15 March, 1904.

RECEIPTS.	EXPENDITURE.
Balance from previous year... \$41 73	Printing OTTAWA NATURALIST, Vol. XVII
Subscriptions, 1903-04 .. \$149	12 nos., 228 pp.... \$286 20
Arrears..... 76	Illustrations 38 62
225 00	Authors' Extras 29 55
Advertisements 42 40	Nature Study Leaflets 22 00
Authors' Extras sold 27 95	Miscellaneous printing : Wrappers,
OTTAWA NATURALISTS sold.. 20	Post cards, etc.... 25 00
Maps of Ottawa sold... 50	
Government Grant..... 200 00	
	401 37
	Postage 21 45
	Editor 50 00
	472 82
	Less 5% for cash on
	printers' account... 19 86
	452 96
	Soirée expenses 32 50
	Sundry expenses, postage, etc 13 14
	Balance..... 39 18
\$537 78	\$537 78

Examined and found correct.

R. B. WHYTE, }
J. BALLANTYNE, } *Auditors.*

ARTHUR GIBSON,
Treasurer.

The Treasurer begs to remind the members of the Club that their subscriptions are payable in advance, at the beginning, not at the end, of the Club year. A great many, he regrets to say, have allowed themselves to get into the habit of not paying their subscriptions until the receipt of a special appeal asking for funds. Members who have not paid their subscriptions for the current year—March, 1904, to March, 1905,—will oblige the Treasurer very much by sending them in as soon as possible. The expenses of the Club in connection with the printing of THE OTTAWA NATURALIST, etc., have to be met from month to month, and it is the wish of the Council that these be paid promptly.

THE CANADIAN SPECIES OF TROCHOLITES.

By J. F. WHITEAVES.

From the dismemberment and reconstruction of so many of the older genera of nautiloid shells of the Cambro-Silurian and Silurian rocks, which the progress of modern research has necessitated, the genus *Trocholites* has emerged unscathed.

First described by Conrad in 1838 and again in 1842, it has since been studied, described more fully, and illustrated, by Hall, Foord, Schröder, Holm and Hyatt.

The original description of the genus in 1838, on page 118 of the Second Annual Geological Report of the State of New York, is as follows: "Shell in the form of an Ammonite; volutions contiguous, gradually increasing in diameter; septa plain." And, the additional definition of the genus, in 1842, on page 274 of the eighth volume of the Journal of the Academy of Natural Sciences of Philadelphia, is in these words: "Involute; symmetrical; whirls contiguous; the back of inner volutions rounded, fitting into a corresponding groove; septa convex; siphuncle near the inner margin." "This genus," Conrad adds, "differs from *Lituites* in having a submarginal siphuncle, and in not being extended into a straight or bent prolongation. The aperture is widely different, being of a lunate outline, whilst in *Lituites* it is nearly round." As now understood, shells of the genus *Trocholites* may be roughly described as small nautilicones, with slender whorls that are compressed on the venter and dorsum and expanded at the sides, their outline in cross section being usually reniform. The surface markings consist of small flexuous transverse ribs, ridges or striæ, often accompanied with spiral raised lines. The sutures of the septa are also flexuous; the siphuncle of the adult shell is placed near the dorsum, or at least on the inner side of the centre; and the chamber of habitation occupies from rather less than one-half to about three-quarters of the outer volution.

In the Guelph formation of Ontario there is a fossil that seems to be identical with the *Lituites multicostatus* of Whitfield (1882) which Hyatt says is synonymous with the *L. Graftonensis* of Meek and Worthen (1870), though it does not belong to the genus

Lituites, as now restricted, nor even to the Family Lituitidæ. This fossil was referred to *Trocholites* by the writer in 1884, and to *Discoceras*, Barrande, by Hyatt in 1894, who, however, admits the "close connection" between these two genera, and, in his latest publication,* includes both of them in his Family Trocholitidæ. It is still perhaps doubtful whether this Guelph species is a *Trocholites* or a *Discoceras*, but in the Cambro-Silurian rocks of Quebec and Ontario there are now known to be at least three undoubted and well marked species of *Trocholites*, upon which the following notes are submitted.

TROCHOLITES AMMONIUS, Conrad.

Trocholites ammonius, Conrad. 1838. Second Ann. Geol. Rep. St. N. York, p. 119.

" " Emmons. 1842. Geol. New York, pt. II, p. 279, fig. 3; and p. 392, fig. 1.

Utica trocholate, Vanuxem. 1842. Geol. New York, pt. III, p. 57, fig. 3.

Trocholites ammonius, Hall. 1847. Pal. New York, vol. I, p. 192, pl. XL, A, figs. 4, a-k.

" " Emmons. 1855. Amer. Geology, p. 146, fig. 29, and pl. XII, figs. 14, a-d, and 15.

" " Ami. 1888. Canad. Rec. Sc., vol. III, no. 2, p. 105.

" " Foord. 1891. Cat. Foss. Cephal. Brit. Mus., pt. II, p. 47.

" " Hyatt. 1894. Phylogeny of an Acquired Characteristic, in Proc. Amer. Phil. Soc., vol. XXXII, no. 143, p. 486.

This species, which is the type of the genus, seems to be well characterized by its "very peculiar, rough, fretted surface" or "cuticular corrugations," that have been minutely described by Hall and Hyatt. Hall says that "this shell occupies a central position in the Trenton limestone" (of the State of New York) "being unknown in the lower part, but passing upwards into the Utica slate, where it is of less frequent occurrence."

So far, in Canada, *T. ammonius* has been found only in the Utica slate or shale. In 1878, Mr. Walter R. Billings showed the

* The article *Cephalopoda* in Eastman's translation of Zittel's Text-book of Palæontology.

writer specimens of it, that he (Mr. Billings) had recently found in the Government House grounds at Ottawa. But, it was not until ten years after this that Dr. H. M. Ami recorded the discovery and recognition of the species in Canada; at Ottawa in the second volume of this journal, and at Murray Bay, Whitby and Collingwood in the third volume of the "Canadian Record of Science."

TROCHOLITES PLANORBIFORMIS, Conrad.

Trocholites planorbiformis, Conrad. 1842. Journ. Acad. Nat. Sci. Philad., vol. VIII, pt. 2, p. 274, pl. XVII, fig. 1.

„ „ Hall. 1847. Pal. New York, vol. I, p. 310, pl. LXXXIV, figs. 3, a—f.

"Volutions higher than wide, longitudinally striated, and with oblique obtuse, transverse lines, approaching at an angle but rounded on the centre of the back; apex profoundly depressed; back of the large volution flattened; aperture much longer than wide. *Locality*. Near Grimsby, Upper Canada, in Salmon River sandstone. This elegant shell was found in a boulder, by Mr. S. Ashmead, of this city" (Philadelphia) "and by him presented to the Academy of Natural Sciences. A specimen was kindly given me by this liberal and enterprising mineralogist" (Conrad. In addition to this, Hall says that the surface of this species is "marked by obliquely transverse ridges, which bend backwards, forming a broad curve on the dorsal line, longitudinally striated with rounded lines." And, in specimens of *T. ammonius*, from the Trenton limestone, he says that he has "rarely found the transverse and longitudinal ridges so strongly marked."

So far as the writer is aware, no other specimens of *T. planorbiformis* than the two types from Grimsby have been found in Canada, as the fossils from Montmorenci or Montmorency Falls and Lorette that Dr. Foord identified with that species in 1891, prove to be referable to the since described *T. Canadensis*, Hyatt.

Hall, in 1847, describes *T. planorbiformis* as one of the fossils of the Hudson River (Lorraine) formation of the State of New York, and his successor, Dr. John M. Clarke, in 1903, in his "Classification of the New York series of geological formations,"

says that "Salmon River" is an early term applied to the local development of the Lorraine beds in New York. So that both in Canada and the United States this species seems to occur at a geological horizon immediately above the Utica shale.

TROCHOLITES CANADENSIS, Hyatt.

Lituites (Trocholites) ammonius, Salter. 1853. Quart. Journ. Geol. Soc. London, vol. IX, p. 86; but not *Trocholites ammonius*, Conrad. 1838.

Trocholites planorbiformis, Foord. 1891. Cat. Foss. Cephal. Brit. Mus., pt. II; but not of Conrad (1842) nor of Hall (1847).

Trocholites Canadensis, Hyatt. 1894. Phylogeny of an Acquired Characteristic, in Proc. Amer. Philos. Soc., vol. XXXII, p. 486, pl. IV, figs. 23 and 24; and pl. VI, figs. 39 and 40.

"Loc., Falls of Montmorency, near Quebec.

"The four specimens representing this species" (*T. Canadensis*) "came from the Bronn collection. They are similar to *T. ammonius* in form, but differ in being broader proportionately in the transverse diameters of the whorls and have deeper umbilici. The whorls are rounded, there being no tendency to angularity, either of the sides or abdomen, and in these specimens the size is small. There are fold-like costæ from an early neanic state, and the living chamber may be considerably over one-half of a volution in length. The exterior is marked by longitudinal lines along the venter and often on the sides, but these have none of the regularity and prominence observable in Conrad's figure, and that figure shows no costations which are more prominent and fold-like in this than in *T. ammonius* or any other described species of *Trocholites*" (Hyatt). These specimens, it may be added, belong to the Museum of Comparative Zoology at Cambridge, Mass.

In 1901 Dr. H. M. Ami collected some interesting fossils from the Trenton limestone at the Natural Steps, a little above the Falls of Montmorency, and among them there are five good specimens of a species of *Trocholites*, which have recently been studied by the writer. They prove to be well preserved and very characteristic examples of *T. Canadensis*, and are in all respects essentially similar to the types of that species, which have been kindly lent to the writer, for comparison, by Dr. W. Y. M. Wood-

worth, the Curator of the Cambridge Museum. And, a study of the original types of *T. Canadensis* and of the similar specimens collected by Dr. Ami, has necessitated the conclusion that the fossils collected by Dr. Bigsby in 1822 at Montmorency Falls and at Lorette, which Salter referred to "*Lituites (Trocholites) ammonicus*" and Foord to *Trocholites planorbiformis*, are also identical with *T. Canadensis*.

To test the correctness of this conclusion, two of the best specimens of *T. Canadensis* that Dr. Ami obtained at the Natural Steps, were sent by the writer early in January last, to Mr. G. F. Crick, of the British Museum (Natural History), for comparison with the presumably similar specimens collected by Dr. Bigsby, in that Museum. In reply to this communication, Mr. Crick thus writes, in a letter dated January 22nd, 1904: "I have carefully examined the specimens in this Museum to which you refer and am quite satisfied that they are specifically identical with the examples of *Trocholites Canadensis*, Hyatt, that you have sent for comparison. The following particulars about the specimens here, may be of interest to you. This Museum contains five examples from Montmorency and two from Lorette, that Dr. Foord (Cat. Fossil Cephal. Brit. Mus., pt. II, p. 49) referred to *Trocholites planorbiformis*, Conrad. The two specimens from Lorette (No. 26568) were presented to the Museum by Dr. Bigsby. The five Montmorency specimens are among the foreign collections transferred from the Museum of Practical Geology. Four of these (c. 4105, *a—d*) were presented to that Museum by Dr. Bigsby, but how the other specimen (c. 4106) was obtained is unrecorded; it bears an original label 'near Montmorenci Falls, near Quebec.'" In a later letter Mr. Crick adds that it would seem that Dr. Bigsby presented examples of the species both to the British Museum and also to the Museum of Practical Geology in 1851.

Professor Hyatt did not state at what particular geological horizon his *T. Canadensis* occurs. But the limestone at and near Montmorency Falls, and at Lorette, is distinctly stated to be Trenton by Dr. Bigsby in 1853,* and by Dr. R. W. Ells in 1889.†

* Quart. Journ. Geol. Soc. London, vol. IX, pp. 84—86.

† Geol. and Nat. Hist. Surv. Canada, Ann. Rep., N.S., vol. III, pt. 2, pp. 22K, and 19K.

The writer has seen no specimens of *T. Canadensis* from Lorette, but if, as seems possible, it there occurs associated with *Plectoceras Halli*, then the horizon of both of these species at that locality may be that of the Trenton rather than that of the Black River limestone.

In Canada it would seem that *Trocholites Canadensis* is characteristic of the Trenton limestone, perhaps of its lower beds, and considerably below the Utica; *T. ammonius* of the Utica shale; and *T. planorbiformis* of the Hudson River or Lorraine formation, above the Utica.

Ottawa, March 15th, 1904.

MOLLUSCA NEW TO THE CANADIAN FAUNA.

While staying at Oxley, Ontario, in the fall of 1903, Miss Mary E. Walker, of Buffalo, N.Y., made a collection of the mollusks found there, which was submitted to me for examination. Among them were two species, which, so far as I have been able to ascertain, have not hitherto been recorded from Canada.

1st.—*VALLONIA PARVULA*, Sterki.

This is a well marked species, easily distinguished from *V. costata* by its smaller size, more depressed form and wider umbilicus. Originally described from the Western States, it was found by myself several years ago at Put-in-Bay. Its discovery at Oxley extends its range still further north. The occurrence of this species at two localities so near together, and so far away from its normal range, with no known record of its having been found in the intervening region, is a curious fact in distribution, and one not easily accounted for.

2nd.—*PISIDIUM DANIELSI*, Sterki.

This is a new species described by Dr. Sterki in the "Nautilus" for August, 1903, (Vol. xvii, p. 42) from specimens collected in Steuben County, Indiana. Its discovery at Oxley is the first record of its occurrence at any other than the type locality.

BRYANT WALKER.

WARBLER SONGS AND NOTES.

By REV. G. EIFRIG.

Now that the crows, the vanguard of the annual bird migration from the south, have arrived, and two or three bluebirds even have coyly appeared in a sort of tentative way, to see whether winter would not soon disappear in earnest, we may reasonably expect to soon see larger divisions of the great bird-army. In April the sinister companies and battalions of the blackbirds often make themselves apparent even to the casual observer, the purple and rusty grackles with their discordant gurgling, and the fine redwinged blackbirds with their martial *congarée*. Besides these some larger birds, which however do not make themselves so apparent, will then come, some herons and hawks; also the little trusty phoebe with the plaintive note from which its name is derived. And then comes glorious May, which brings surprises and joys each day in the animal and vegetable kingdoms. Then huge waves of warblers, finches, thrushes, vireos or greenlets, plovers, etc., arrive daily. Then is the time for every one who can, naturalist, professional, amateur or otherwise, lovers of nature and the beauties of it, to arm themselves with an opera glass and lens, and note book, and see, observe, behold and drink in as it were the beauties and lessons and mysteries that nature holds up to our raptured vision. Some of the finest and most interesting objects that we then can and ought to become acquainted with are the birds. Watch them with or without glass, try to impress their chief characteristics on your mind, and if you do not know the bird and are a beginner in bird-craft, look up at home your *Bird Neighbors*, or some other popular book on birds, and see what the bird you did not know was. And the more you learn thus by your own exertion, which is at the same time pleasure, also healthful to a degree, the more you want to learn and find out; the love of it will grow on you.

After knowing the birds by their color, size, etc., a person should try to attain some proficiency in recognizing them by their songs and other notes. Of course, if all the birds would announce their names as plainly as the chickadee, or the phoebe or bobolink, this would be comparatively easy. However, this is not the case,

and therefore, it takes more or less patient observation to be able to tell them by their notes.

Some of our prettiest, but at the same time smallest and most elusive birds are the warblers. On some days the open woods are full of them. They are abundant and pretty, yet most people never see them, even if they are at home in their orchards, because they are so small and restless, always moving about. Most of them are so beautifully and conspicuously marked, that if a person once knows when and where to look for them he can readily become acquainted with them. But it takes much patience and stretching and twisting of necks to accomplish it. Therefore, I soon after undertaking it came to the conclusion that it would be advantageous to be able to recognize a warbler by its song or rather lisping—for that is in many cases all, despite their name as a class—that their musical efforts amount to. And to aid nature and bird lovers to learn to know and identify warblers is the *raison d'être* of this article.

When I heard a warbler song I did not know, I followed up its owner until I positively identified him, then I tried what syllables would reproduce the impression best, and these I jotted down in my note book on the spot. These first impressions sometimes have to be corrected later on, often the first is as good as the last. This I would advise everybody to do who would learn to know the birds by their song.

The following list is loosely arranged according to the time of appearance of the different species at Ottawa, and to the degree of frequency in which they are generally seen.

BLACK AND WHITE CREEPING WARBLER, *Mniotilta varia*. To be seen in open woods of deciduous trees, creeping around limbs and trunk of trees, not high up; color as implied by name. Song insignificant, a repetition of the syllable *sweet*. One I heard sang: *Switta, switta, switt*. One writer gives its song, *Weachy, weachy, weachy, twee, twee, twee, twee*.

YELLOW WARBLER, *Dendroica aestiva*. This common warbler is entirely yellow, the male having narrow reddish stripes on the lower side, which are apparent only at a near view. This is a bird not so much of the woods as of the open, frequenting trees in fields, along fences and even in cities, where it also nests. Its

song is, *Sweet, sweet, sweet, sweet, sweeter, sweeter, or Sweet, sweet, sweetie, or Weeche, chee, chee, churwee*, as Prof. Lynds Jones gives it.

REDSTART, *Setophaga ruticilla*. This pretty feathered bit of energy and restlessness can be easily recognized by its conspicuous salmon red with black, which it always displays fully. Its note is not so distinctive; I could never formulate it in syllables to give satisfaction; it is much like that of the preceding two species. Mr. Chapman gives it *Ching, ching, chee, ser-wee, swee, swee-e-e*.

CHESTNUT-SIDED WARBLER, *Dendroica pensylvanica*. The adults of this species are easily told by the chestnut stripe on sides and bright yellow crown. They frequent second growth deciduous woods; they nest low. Song: *Peary, peury, pee-a*, rather subdued. Miss Roberts gives it, *Tsee, tsee, tsee, happy to meet you*.

OVENBIRD, *Seiurus aurocapillus*. Abundant in open woods, walking on the ground looking for ants. Its common song with which it greets intruders in its domain is exactly rendered by Mr. Burrough's transcription: teacher, teacher, TEACHER, TEACHER, TEACHER. Some however, seem to put the accent on the second syllable, or at least many hear it that way, some like *te chee*, etc.

MARYLAND YELLOWTHROAT, *Geothlypis trichas*. This cheerful and nimble little sprite can easily be identified by its markings as well as by its song. It is bright yellow on breast and head, except a black band on cheeks, ear coverts and forehead. Its song plainly is: *Witchety, witchety, witchety*; accent on first syllable. It frequents bushes and prefers swampy or at least wet situations.

YELLOW-RUMP WARBLER, MYRTLE WARBLER, *Dendroica coronata*. Has four yellow patches on crown, at shoulders and on rump, otherwise bluish-gray, streaked with black. Not much given to song: one author gives it, *Twhip tweeeter, tweeeter*.

BLACK-THROATED GREEN WARBLER, *Dendroica virens*. Its colors are indicated by the name, yellow on under side. Its song, if once heard well, can not easily be forgotten. It is: *Dee-dee, dee, ah-di*. It is loud, ringing, cheerful. Prof. Jones has heard it this way, *Pe te, che-o te*.

BLACK-THROATED BLUE WARBLER, *Dendroica caerulescens*. Where the preceding one is found, this one may also be looked for. They frequent bushy, open woods and are mostly seen in the branches of medium sized trees. Its best song is ; *Dill-dill dill-dreeé*, rapid, ascending. When busy feeding or later in summer it abbreviates this into, *Re-dereé-di*, *Tsree tsree tsree*, or even a shrill, whistle-like, *Trree*.

MAGNOLIA WARBLER, *Dendroica maculosa*. This handsome black and yellow warbler has quite a repertoire of lays and ditties, which all however do not amount to much. Its best performance is a loud, impulsive, *Iree dereé di*. At other times it sings like the Chestnut-sided warbler: *Peary, peary pee a*; then again monotonously: *Tsee, tsee, tsee*, etc., or it utters a rather melodious disyllable *Tsee-wit, tsee-wit*.

BLACKBURNIAN WARBLER, *Dendroica blackburniæ*. This winged gem of black, white and deep orange sings little and then very poorly, a faint, hesitating, *Dee dee dee*, in one pitch of tone, or even only : *De de de*.

PINE WARBLER, *Dendroica vigorsii*. True to its name, this warbler lives only in pine-woods or in single pines amongst deciduous trees. Its color is dull olive and the song exactly like that of the Chipping Sparrow ; it cannot well be reproduced by syllables.

CANADIAN WARBLER, *Wilsonia canadensis*. This warbler is of a somewhat pensive and retiring disposition. It prefers swampy and bushy places. The breast is bright yellow, with a neck-lace of black spots, back bluish gray. The only song I have heard sounds like a faint imitation of the Maryland Yellow throat, a subdued, halting : *Witchety, witchety*. When alarmed in their quiet haunts they utter a sharp *tsip* or *tsink*.

BLACKPOLL WARBLER, *Dendroica striata*. Black and white, with a black crown, larger than most warblers, Its song is a very insignificant dry : *De de de*, uttered very leisurely.

NASHVILLE WARBLER. *Helminthophila ruficapilla*. A bright yellow warbler, bluish gray on top. The song is variable. Some give it : *Wee-see, wee-see, wit-a-wit-wit*; others : *Ke-tse, ke-tse, ke-tse, chip-ee-chip-ee-chip*. Rather loud and lively.

BAY-BREASTED WARBLER. *Dendroica castanea*. A migrant only here. Song just like that of the redstart.

TENNESSEE WARBLER. *Helminthophila peregrina*. Song like that of the chipping sparrow, except first two syllables, which are *twip* instead of *chip*.

CAPE MAY WARBLER. *Dendroica tigrina*. Rather rare migrant and rather quiet too. Song something like black and white creeper: *awit, awit, awit, awit, awit*, as Prof. Butler puts it.

PARULA WARBLER, Blue Yellow-back Warbler. *Compsothlypis americana*. "Parula's song is hardly wiry, but it is fine and delicate—more like hair than wire. The more delicate singers seem to say, *Pe-tse, pe-tse, pe see see*, or: *cher-re-re, chér-re-re, cher-re-re*."

PALM WARBLER, *Dendroica palmarum*. Song: *Tsee, tsee, tsee, tsee*, with a distinct swell. (Prof. Jones).

YELLOW PALM WARBLER. *Dendroica palm hypochrysea*. Like preceding.

MOURNING WARBLER. *Geothlypis philadelphia*. Song: *Tee te-o, te-o, te-o, we-se*, or: *True, true, true, true too*.

WILSON'S WARBLER. *Wilsonia pusilla*. Song like yellow warbler or redstart.

Ottawa, March 28, 1904.

HUGE PUFF-BALLS.—Mr. J. Smith of the Topographical Surveys Branch, found a very remarkable puff-ball (*Lycoperdon gigantum*), about a mile from Breckenbridge Station, on the Pontiac and Pacific Railway, on the 25th of August, 1903. It measured 56 inches horizontal girth, and 44 inches vertical girth, a perfect specimen with skin as white and smooth as a piece of kid. There were five other large ones within a few feet of it, some of them decayed, others not fully grown. Mr. Smith has seen large puff-balls at the same place for several years back. Such specimens are not rare about Ottawa, but it is believed that that found by Mr. Smith is the largest ever seen in this district.

JOHN MACOUN.

THE EVENING GROSBEAK.

(Coccythraustes vespertina.)

By C. J. YOUNG.

The readers of THE OTTAWA NATURALIST who are interested to any extent in our birds, will learn with interest that a migration of evening grosbeaks has occurred this winter in Ontario. This bird always creates an amount of interest, partly by reason of its rarity and beautiful plumage, and partly because its summer home and breeding habits are still but imperfectly known.

It visits Ontario at long intervals; this year it has been seen in pairs and small flocks in the neighborhood of Kingston, Ont.,—even within the city limits. A beautiful male was procured by Mr. E. Beaupré on Feb. 23rd, which I saw in the flesh shortly after it was shot. A pair was secured out of a flock at Cataraqui during the same week, and birds had been observed at Williamsville during January. In each case they were feeding on the seeds of the Manitoba maple (*Negundo aceroides*), a tree that only of late years has assumed sufficient proportions in Ontario to bear fruit. It will be interesting to learn whether this bird has been observed elsewhere in Ontario during the present winter.

The evening grosbeak is a rare bird everywhere, though of more frequent occurrence in the west than in the east. It was first described by Mr. William Cooper, of New York, from a specimen obtained by Mr. Schoolcraft near Sault Ste. Marie in April, 1823. The next specimen recorded was obtained in the month of August in the same year by Major Delafield, north-west from Lake Superior. From that time to the present the bird has been occasionally recorded in Canada, but as far as I know there is no record of the discovery of the nest except from the United States.

According to the late Mr. McIlwraith, of Hamilton, Ont., the first report of its appearance in the settled parts of Ontario was in the year 1866, when in the month of May two were obtained by the late Dr. T. J. Cottle at Woodstock. The next record was in 1871, when they were observed in the spring near London, Ont.

Then in March, 1883, Mr. McIlwraith himself saw two near West Flamboro.

The largest migration seems to have been in 1890, when they were frequent about Kingston and elsewhere, and a flock was noticed as far east as Quebec. Again in 1896 two were seen at Kingston. Then none until the present year, 1904, when, during January and February, they have been observed and obtained about Kingston. This completes the record for Ontario to date.

With regard to the nest of the bird and its breeding habits, the honor of discovering it rests with Mr. Jno. Swinbourne, of Springerville, Arizona, who found it on 5th June, 1884, in a canon 7,000 feet above sea level. (*Vide Auk*, vol. v, p. 113.) The next nest was recorded by Mr. W. E. Byrant, as taken by a Mr. Fiske, of the U. S. Geol. Sur. on a hill-side in Yolo Co., Cal., in 1887. The third and last record I can find was a nest and four eggs collected by Mr R. H. Beck in the Sierra Nevada Mts., in 1896, a beautiful colored plate of which is published as a supplement in the *Nidologist*, Sep. 1896, vol. iv, No. 1.

NOTE.—Mr. Edwin Beaupré has sent for publication in *THE NATURALIST* his notes on the occurrence of the evening grosbeak, The substance of these notes has been embodied in Mr. Young's article above, but Mr. Beaupré says further: "The two flocks that visited the city spent their time feeding on the fruit of Manitoba maple. Locally, this winter's visitation makes the third record since 1890. From the 22nd to the 25th I saw them each day; one evening when I visited the street on which the maples are growing, I found three richly colored males whose striking plumage of white, yellow and black, brightened by the departing rays of the wintry sunset, seemed entirely out of contrast with their surroundings of bleached and withered fruit on which they were sumptuously feasting.

NATURE STUDY—No. XII.

SCHOOL GARDENS IN GREAT CITIES.

(Report of Committee on Industrial Training submitted to the Public Education Association of Philadelphia.)

Facing the Hudson, on the west side of New York City, is a piece of condemned land awaiting improvement, ironically called DeWitt Park. The most vivid imagination could not have conceived a more desolate spot than this was in the summer of 1902. Approached from the east through filthy streets, crowded with noisy, dirty urchins, it loomed up a dark blot on the beautiful background of cool river, green hills and blue sky. Rows of tumble-down houses, disused carts, piles of rubbish, stones, rags and litter, among which the children played, made even the streets seem neat and orderly by comparison.

In the centre of this plot of ground it was evident that something of more than ordinary importance was occurring. The air was black with flying missiles, while excited groups of children ran hither and thither. To all enquiries came the reply, "We are getting ready for our farm." The idea of a farm in that unfavorable spot might have made the inquirer slightly skeptical, but had he stayed to see, the changes wrought were little short of marvellous. The children's ready hands, assisted by older brothers and sisters, and by workmen from the Park Department of Manhattan, accomplished wonders. Stones and rubbish vanished, the hard earth yielded to the plow and harrow. Load after load of rich loam was bought. A fence enclosed the selected space. Walks were laid out, and plots marked, and after days of earnest work the "farm" was ready to receive the seed.

Twenty-five children filed in at the gate and received a practical lesson in planting from the gardener. Teachers meanwhile registered names and properly tagged each "farmer." These tags, upon each of which the name of the child and the number of the plot assigned were registered, were certificates of ownership to be presented at the gate as a pass to enter. The lesson over, the children marched to their respective plots and planted the seeds given to them as they had been shown how to do by the

gardener. New groups followed them, and soon in that desert waste rose an oasis of living green, orderly, neat and picturesque—the first Children's School Farm in New York City.

One hundred and twenty-five farmers cared for their plots during the first season, but in the following spring so many requests for "farms" were received that the Park authorities decided to enlarge the space allotted, so that nearly three hundred boy and girl farmers, varying in age from eight to eighteen years, were happily employed during the summer of 1903. Through the long hot days of July and August you might see them watering, weeding, hoeing, or quietly sitting around the central flower plot listening to a Nature Study talk by the attendant teacher.

Improvements upon the surrounding land followed rapidly in the wake of those upon the farm. Toward the east, the Park Department had placed a huge open air gymnasium and playground. Toward the west, a tiny country seat, with a 12 by 18 ft. farm-house. A green lawn and flower beds, a pavilion, a pig-pen and a chicken house had been added to the farm property. Still further west stood a sand tent, and a second canvas formed a resting place for tired mothers. A typical afternoon might have shown eighty or a hundred children busy in the gardens; in the pavilion a sewing class and a group weaving baskets for farm produce; in the tiny house tea being served by neatly aproned housekeepers; while on the lawn the boys played croquet. During September groups of children from neighboring kindergartens flitted through the garden in the mornings, while the proud owners appeared when school hours were over, basket or bag in hand, ready to carry home their harvest, and spade over their plots, leaving them clean and neat, prepared to defy winter's coldest blast.

As order emerged out of chaos, as stones and rubbish disappeared, the restless, careless horde of children grew daily more quiet and gentle. The wilderness that blossomed as the rose was not only the oasis in the desolate waste of ground, but also in the hardened little lives, now softened by God's wholesome sunshine, in the careless hands that grew so tender with the delicate blossoms, the wayward feet that learned to run the narrow paths

without swerving to the right or left, the half opened eyes, before seeing naught but the factories around, now dimly describing the Hudson and the light on the hills beyond.

The history of the making of the New York Garden is that of gardens in many cities. Back yards are no longer unsightly. In some cases the stone flagging of the school yard has given place to miniature gardens of great beauty. Historically, gardens for instruction have been an educational factor for many centuries. Nearly 2500 years ago Persian boys received instructions in agriculture and horticulture, in gardens set apart for that purpose. Through the middle ages gardens for educational purposes existed throughout Central Europe. The first definite movement toward establishing *school* gardens was made in Australia in 1869, when a law was passed instituting gardens in connection with all schools in country districts.

In *school* gardens must lie the main interest of those who believe that the public schools are the basis of national character. Statistics upon this subject are difficult to obtain, but an idea of the extent to which this branch of education is carried in European countries may be obtained from the following statement. In Austria there are no less than eight thousand school gardens, in Sweden two thousand and sixteen, while in France practical gardening is taught in 2,800 primary and elementary schools.

America has only begun to realize her opportunity in the value of school gardens as an educational force among the thousands of children in her crowded cities. An effort is being made to attract the attention of educators to the "Model School Garden" which, directed by Mr. Hemenway of the Hartford School of Horticulture, will be a most attractive feature of the World's Fair at St. Louis.

If the Public Education Association of Philadelphia succeeds in its effort to have at least one school garden opened in the summer of 1904, the garden movement will have been at least inaugurated in four great Eastern cities, New York, Boston, Philadelphia and Washington. The first school garden in America was started by Mr. Henry S. Clapp at Boston, in 1890. The garden was originally intended for wild flowers and so well has the

work succeeded that at the present time it includes more than one hundred and fifty native wild plants. In 1901, a large vegetable garden was added to the flower garden. Last season Boston had sixteen of these gardens and with only this small number Boston is yet far ahead of other cities in America in the school garden movement. The work at the Hartford School of Horticulture, under its capable director, Mr. Hemenway, has attracted considerable attention. Boys and girls come from the city to care for their gardens, of which there were one hundred and sixty-three last season, with the supply still far short of the demand.

At the Massachusetts State Normal School, at Hyannis, Mass., a portion of the campus was converted into a garden, which, from a commercial standpoint, was ably conducted. Each pupil was provided with a blank book into which he copied bills of the produce sold, the deposits at the bank and the checks drawn. The amount that was realized the first season was thirty dollars.

Although not connected with any institutions of learning, the Boys' gardens of the National Cash Register Co., in Dayton, Ohio, have been most important in the results that they have effected. The gardens here are 10 by 130 feet, or larger, large enough to be of commercial importance. As an example of what can be done with a garden of this size, "one boy provided a family of five with vegetables during the entire season, and in addition to this made five dollars." A competent gardener instructs the children in their work. There are various gardens in other cities in connection with schools or settlements, but the work is extremely irregular.

An idea of the cost for maintaining a school garden of one-half acre during the first season may be obtained from the following rough estimate given for Philadelphia.

Preparation of ground, including fertilizers	\$35 00
Fencing, tool-house, tools	225 00
Literature, insect mounts, materials for simple experiments	10 00
Seeds and plants	30 00
Total	\$300 00

This estimate does not include the salaries of attendant teachers. Trained teachers are more valuable than agriculturists without knowledge of pedagogical methods. Teachers not versed in agriculture may be supplemented by a good gardener; if, however, the teachers do understand gardening, a laborer may take the gardener's place. This man occupies an important position in the work. He supplies the place of a janitor and assists the children in any work that is too heavy for them, such as breaking up earth with a pick-axe or managing a fifty-foot hose. During the fall, when the children are at school most of the day, he acts as a watchman, sending away truants, and during this time when weeds grow rapidly and the children's hours of work are few, he also assists in keeping the garden clean. The supervisor of the garden must be a woman that is capable of supervising and directing the work of preparing the ground, laying out plots, and erecting buildings. Some knowledge of surveying, plotting and draughting is also indispensable to her, as she will necessarily have to plan the laying out of the garden and direct both children and workmen. Upon the supervisor falls the duty of engaging workers and the responsibility of overseeing each step. Estimates and purchases of seeds and plants and the whole government of the practical gardening is to be planned by her. In addition to this, she usually gives daily nature-study talks, which must be adapted to the varying ages of the children. As harvesting progresses accurate records of produce per child, attendance of said child, effect of work upon his physical, mental and moral being must be registered. All of these steps are worth while because gardening is yet in its infancy and statistics must be obtained to convince those unwilling to embrace the idea, of its merit. Such individual records must be kept for two hundred and fifty children, to be afterwards added, balanced and the average found, more than filling the teacher's time during the hours in which the children are at school. Many interruptions to this work occur in the form of visiting classes to which the supervisor explains the work of the garden.

In Porto Rico, where school gardens are maintained by the United States government, and are connected with every public school, teachers are regularly trained for the work in the course of

theoretical and practical lessons on Agriculture. Trained teachers are somewhat difficult to find. Both Boston and Washington have foreseen this difficulty and are preparing young women for garden work,—Boston by means of the Science Department of her Normal School, Washington by a special course for Normal students, given at the school by Prbt. S. C. Corbett, Horticulturist of the United States Department of Agriculture.

The Public Education Association of Philadelphia has been conducting correspondence upon the subject of school gardens, and the letters received seem to show that gardens have been connected more frequently with public schools than with private institutions, and that while the work has never been compulsory upon either teachers or pupils, it has proved a popular novelty wherever undertaken, giving healthy out-of-door study. Unfortunately the lack of space in great cities restricts the privilege of practical gardening to a comparatively small number of schools. A similar reason and consequently dearth of accessible material have been given for the lack of properly conducted nature-study in our public schools. Europe is in this respect far ahead of America. In Berlin, for instance, special gardens are maintained by the municipality, in which flowers, shrubs, and vegetables are grown in order that specimens required may be daily picked and sent in waggons hired by the city to those schools so situated that gardening is an impossibility. It has been suggested and advocated by at least one Associate Superintendent of Schools in New York City, also Mr. Gustave Straubenmüller, that a portion of Central Park be set aside for this purpose, and that specimens from its school garden be then sent daily to schools in Manhattan. Other parks that are used little by the public might fulfil a similar function. This at present seems to be the only solution of the problem of supplying schools with proper materials for Nature-study. As a new idea this may seem preposterous, but the day of experiment is past; Nature-study and gardening have become important educational factors, and thinking men and women are devising means to bring them within reach of every child in the public schools.

Of the neglect of this subject in our country Mr. Hamilton W. Mabie, in his "Essays on Nature and Culture," says: "Once

in a while some discerning man outside of the regular school interests, sees the inconsistencies of educational systems. Relationship with nature is a source of inexhaustible delight and enrichment. To establish it ought to be as much a part of every education as the teaching of the rudiments of formal knowledge, and it ought to be as great a reproach to a man not to be able to read the open page of the world about him as not to be able to read the open page of the book before him."

(Signed) HELEN CHRISTINE BENNETT,
1206 Stiles st., Philadelphia.
Instructor at Children's School Farm.
New York City, 1902-1903.

Philadelphia, January 12th, 1904.

NOTE.—The Children's School Farm in New York City was an original scheme of Mrs. Henry Parsons, a member of the Local School Board of the 11th School District of Manhattan, to whom the writer feels that she owes a lasting debt of gratitude for the training received during the past two summers. The success of the School Garden idea in New York is entirely due to the untiring energy and perseverance of Mrs. Parsons.—H. C. B.

The foregoing excellent article is sent to THE OTTAWA NATURALIST by Mr. R. H. Cowley, who has collected extensive information on the subject of School Gardens. In this connection many of our readers will follow with special interest the Macdonald School Garden experiment which will be inaugurated this spring under Mr. Cowley's direction in the County of Carleton.—J. F.

MAY, 1904.
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CONTENTS.

	PAGE
1. The Grasping Power of the Manus of <i>Ornithomimus altus</i> , by Lawrence M. Lambe	33
2. Some Canadian Antennarias, by Edw. L. Greene	37
3. Relationship between the Weather and Plant Growth, by Cephas Guillet.	40
4. Meetings of Entomological Branch.	55
5. Meeting of the Botanical Branch.	58
6. Nature Study—No. 13.	61

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No. 2

THE GRASPING POWER OF THE MANUS OF ORNITHOMIMUS ALTUS,* LAMBE.

By LAWRENCE M. LAMBE, F.G.S., F.R.S.C., of the
Geological Survey of Canada.

(With two plates.)

In the collection of vertebrate remains from the Belly River series of the Cretaceous of Alberta, Canada, made by the writer in 1901, there are a number of phalanges of the manus of *Ornithomimus altus* that throw further light on the structure of this dinosaur and on its probable habits. As little is known of the manus, or indeed of the skeleton generally of the different species of this genus, it is thought that a few descriptive remarks on the phalanges of the Belly River form may prove of some interest.

Of the pes of *O. altus* we already know that it was adapted to swift running and that the digits terminated in long, rather straight, pointed claws.

Five species of the genus have been named by Marsh from the Upper Cretaceous of the Western States. These are: *O. velox* from the "Ceratops beds of Colorado," *O. tenuis* and *O. grandis* from the "same horizon in Montana," and *O. sedens* and *O. minutus* from the "Ceratops beds of Wyoming." Of these species scarcely anything is known of the fore limb. Marsh describes and figures the metacarpals of *O. velox* and a claw bone of the manus of *O. sedens*.

The material collected by the writer does not admit of the reconstruction of the entire manus. It proves that the claws were of quite a different shape from those of *O. sedens*. (Fig 9.)

*Communicated by permission of the Acting Director of the Geological Survey of Canada.

The Upper Jurassic compsognathoid form, *Ornitholestes hermanni*, lately described by Professor Osborn, shews many points of resemblance to its supposed successor *Ornithomimus altus*. Like *O. altus* it was terrestrial in its habits and a swift runner. The similarity in form of the ungual phalanges of the manus in the two species is strikingly apparent (see figs. 8 and 4). Among the remarkable characters of *Ornitholestes* is mentioned as most distinctive "the narrowing of the manus and the great elongation of the metapodials and phalanges of the second digit, suggesting the rapid grasping power of agile and delicate prey."

Compared with that of *Ornitholestes* the manus of *Ornithomimus altus* is much stouter and less elongated, but it probably had an equally great grasping power. The terminal phalanges curve more rapidly, are proportionately deeper proximally but are less compressed laterally; from those of *Ornithomimus sedens* they differ in being deeper, much more curved and in having a greater lateral compression.

The phalanges of the manus of *Ornithomimus altus* represented in the accompanying figures, 1—6, are presumably those of the second digit; they all resemble those of the pes in being to a certain extent hollow.

The proximal phalanx is about one-third longer than the second one and about the same length as the distal one. Its proximal end is conspicuously enlarged above and at the sides and the articular surface (fig. 1a) is evenly concave. The condyles of the distal end are greatly enlarged in a vertical plane and a deep channelling of the articular surface extends in a curve round the end through an angle of about 223° . Posteriorly below a decided roughening of the surface of the bone occurs for muscular attachment.

The second phalanx (fig. 2) is short above but a backward extension of the inferior surface adds greatly to its length below. The proximal articular surface exhibits a sharp vertical keel, on either side of which the bone is well excavated; the distal surface has a decided medium groove extending through an angle of 180° . The enlargement below the proximal articular face combined with a well-defined roughening of the bone suggests great muscular

strength at this point. Both these phalanges are laterally compressed and have deep excavations, in the form of round pits, on either side of their distal ends. These pits are more decided on one side than on the other.

The ungual phalanx (fig. 3) is deep proximally, is much compressed laterally and terminates in front in a sharp point that is directed downward when the articular face is in a vertical position. A well-marked claw groove extends, on either side from the upper border at the apex, backward for about two-thirds of the length where it bifurcates, the upper groove reaching the articular surface below the upper border, the lower and deeper one passing downward behind a roughened enlargement of the lower surface for the attachment of the flexor tendon. The bone is rough also on the sides and upper border for a short distance in advance of the articular face. This face is vertically concave with a moderately well defined median keel extending from the lower to the upper margin.

Besides the phalanges of the second digit figured, the corresponding ones of the other manus were also obtained, as well as a few, including distal ones, belonging to other digits, all presumably of the same individual. The additional ungual phalanges are smaller than that of the second digit, are broader in proportion to their length and not so deep (see fig. 7).

In the original description of *Ornithomimus altus* reference is made to the phalanges above described as well as to the distal end of the interrupted first metacarpal, all found within a few feet of each other in the Red Deer river district of Alberta (Belly river series).

Figure 5 indicates the amount of rotation possible of the second and distal phalanges round the proximal phalanx. This is principally due to the extensive development of the distal articular surface of the proximal phalanx and is suggestive of great grasping power.

It may be surmised that *Ornithomimus altus* was capable of rapid motion in pursuit of prey which it had the power of tenaciously grasping with its fore limbs. The claws covering the terminal phalanges of the manus were evidently both long and sharp.

Ornitholestes is supposed to have pursued such "agile and delicate prey" as the Jurassic birds; *Ornithomimus altus*, also a rapid runner but of larger build, with a more robust manus of a strong grasping capacity, may be supposed to have attacked larger animals, possibly those not unworthy even of the notice of his more bulky and formidable contemporary *Deinodon horridus* of Leidy.

Ottawa, Dec. 23, 1903.

EXPLANATION OF PLATES.

PLATE I.

Phalanges of second digit of manus of *Ornithomimus altus*, natural size.

Figure 1.—First phalanx viewed from the side; 1*a*, from behind; 1*b*, from in front; 1*c*, from below.

Figure 2.—Second phalanx viewed laterally; 2*a*, from behind; 2*b*, from in front; 2*c*, from below.

Figure 3.—Third or terminal phalanx as seen from the side; 3*a*, from behind; 3*b*, from below.

PLATE II.

Figures 4 and 5.—Lateral views of the phalanges, figured in Plate I, to shew rotation. Figure 5 represents the position of the phalanges when grasping.

Figure 6.—The same phalanges from below.

Figure 7.—Ungual phalanx of manus of *Ornithomimus altus*; probably that of third digit.

The above figures natural size.

Figure 8.—Terminal phalanx of second digit of manus of *Ornitholestes hermanni*, Osborn, side view; one-half natural size.

Figure 9.—Terminal phalanx of manus of *Ornithomimus sedens*, Marsh, side view; one-half natural size.

SOME CANADIAN ANTENNARIAS.—II.

By EDW. L. GREENE.

Continuing the study of the Chilliwack Valley material collected by Mr. James M. Macoun in 1901, it becomes more and more evident that the genus *Antennaria* is strongly developed in British Columbia; so much so, that for the western slope of North America it may be said to have there its centre of distribution. And this interesting forecast is further warranted by the fact that, from the vicinity of Banff, Mr. N. B. Sanson has obtained, among other species of the genus, at least two more that are hitherto undescribed.

In attempting to describe the new species, I can not but regret the absence of specimens of the staminate, or male plants; for these have their own characters that help to establish the validity of species; and I would beg of future collectors of British Columbian Antennarias, that they make special search for male plants. They are, it is well recognized, less common than the pistillate; but they should be sought, diligently, at every opportunity.

A. SEDOIDES. Low, loosely matted, rather obviously suffrutescent, the short and slender stolons bearing a rosette of leaves at the end, these scarcely $\frac{1}{2}$ inch long, rather abruptly spatulate-contracted below a very broad and short obtuse terminal part, both faces finely densely and permanently silvery-woolly or satiny; flowering stems only 2 or 3 inches high, very slender but firm, their lower leaves oblong-linear, the upper linear: heads 4 or 5, their involucre with ovate rather acute dull-white scarious tips.

By roadsides at Banff, B.C., 28th May, 1901, N. B. Sanson; only pistillate plants, and these much too young; not even yet in flower. But the rosetted stolons, looking like those of some *Sidum*, are very characteristic.

A. SANSONII. Short leafy stolons and slender though firm stems closely tufted, the latter 6 or 8 inches high; basal leaves small and very narrow, linear-spatulate, acutish, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, densely, closely and very permanently silky-woolly, the

cauline linear, acute or acuminate, erect ; cymes neither dense nor lax, of 8 or 10 heads of middle size ; involucre rather strongly woolly at base, each bract marked with a brown spot at base of the long and conspicuous scarious but faintly pinkish tip, only the innermost tips acutish, the others obtuse, all apt to be a little incised.

A rather neat and elegant firmly erect species, obtained by Mr. H. B. Sanson on the slopes of Sulphur Mountain, near Banff, B.C., 16th July, 1901. It is somewhat related to *A. acuminata*, although distinct enough by its compact habit, and permanently silvery foliage. Even the dead leaves of a former year are not divested of their indument. The type is the Geol. Survey No. 26,857.

A. CHLORANTHA. Low, rather loosely tufted, 3 to 5 inches high, the short stolons not densely leafy, and leaves large for one of the *A. alpina* group, the largest about an inch long, cuneate-obovate to obovate-spatulate, acutish and mucronulate, white with a rather loose and flocculent (not compact and silvery) indument, this deciduous, the leaves of the former year quite glabrous and of a light green ; those of the stem about 4, an inch long, oblong-linear, acute, suberect, less woolly : cyme capitate, the sessile heads about 5 ; bracts of the involucre with long deep-green scarious tips elongated and mostly acute, the innermost acuminate.

Chilliwack Valley, B.C., at 6,500 feet, by Mr. J. M. Macoun, 23 July, 1901, being No. 26,197 of the Survey ; also apparently the same under No. 26,196, from an altitude of 5,600 feet. All the specimens are too young, and show only the pistillate state, unfortunately ; but the species is well marked as to habit, foliage and pubescence.

A. LANULOSA. Habitally resembling *A. chlorantha*, taller, more slender, the stolons rather rigid, sparsely leafy, the leaves smaller, more abruptly narrowed from below the obovate summit, of thinner texture, loosely white-woolly, those of the preceding year glabrous but brown and dead ; cauline linear, acuminate :

cymes large, of 8 to 12 rather large heads ; involucre short but well imbricated, the scarious part of the bracts light brown, the outer obtuse, the inner scarcely acute : small achenes minutely glandular-hirtellous.

Chilliwack Valley, B.C., at 6,000 feet, J. M. Macoun, 29 Aug., 1901. Notwithstanding some likeness to the preceding, I doubt if this belongs really to the *A. alpina* group of species. Geol. Surv. No. 26,194.

A. MACULATA. Rather compact, the slender flowering stems only 2 to 4 inches high : short stolons densely leafy ; leaves $\frac{1}{2}$ inch long, obovate-spatulate, subcoriaceous, loosely white-woolly when young, glabrate on both faces in age and of a light green ; small stem-leaves suberect, varying from spatulate-linear and obtuse in the lower to oblong-linear and acute in the upper : middle-sized heads about 5, capitate-clustred ; bracts of the involucre unusually numerous and imbricated, each with a conspicuous dark spot in the middle just below the base of the scarious tip, the tips dull-white, broad and short, the outer acute, the inner obtuse, all irregularly and incisely serrate under a lens.

Also of the Chilliwack Valley, by Mr. Macoun, 29 Aug., 1901, from an altitude of 6,000 feet. The specimens are rather immature, and of the pistillate plant only, unfortunately. The Geol. Surv. number is 26,195.

Washington, D.C., March, 1904.

BIRD NOTES.—On April 26th, I surprised a pair of migrant shrikes (*Lanius ludovicianus migrans*) in the act of making a meal of a song sparrow. Rather large prey for so small a shrike. Their usual food is beetles.

Mr. J. H. Fleming, of Toronto, writes me that he once saw a Connecticut warbler at Ottawa. He being a highly capable observer, this is an addition to the local bird-list.

G. E.

RELATIONSHIP BETWEEN THE WEATHER AND PLANT GROWTH.

A COMPARATIVE STUDY OF THE LAST TWO SPRINGS.

By CEPHAS GUILLET.

During the spring of 1902 and that of 1903—that is to say from the latter part of March to the latter part of June—I have observed about 360 wild plants in bloom in and around Ottawa, 300 of which are natives. I have selected about half, or 170 (all but 27 being natives), as being the most accurately observed during both years as regards their first coming into bloom. For purposes of accurate comparison I have divided each month into periods of ten days, and shall call these periods the first, middle and last periods of the month. When the month has thirty-one days the last part contains eleven.

Of the 170 plants, I find I observed 33 to come into bloom on the same date each year, namely 9 in the middle and 8 in the last part of April; 5 in the first, 5 in the middle and one in the last part of May; and 4 in the first and one in the middle part of June. It will be observed that the synchronous observations are especially numerous in April, half occurring then, and become less numerous as the season advances, there being only six during the last part of May and the month of June. If this were all the evidence we had, we might surmise that the two seasons ran more nearly parallel during the first half than during the last, which is unusual.

But the other observations establish this in a more exact and satisfactory manner. Of the remaining 137 plants under discussion only 39 bloomed earlier in 1902, while 98 bloomed earlier in 1903. And of the 39 which bloomed earlier in 1902, 31, or about 80 per cent of them, bloomed in March, April and the first part of May, while of the 98 which bloomed earlier in 1903, only 11 bloomed in the corresponding period. The table given herewith will make this plainer. It shows in a striking way that the season of 1903 overtook and passed that of 1902 before the middle of May.

TABLE SHOWING THE PARALLELISM OF TEMPERATURE AND PLANT-GROWTH DURING THE SPRINGS OF 1902 AND 1903.

	March.			April.			May.				June.			Total.	
	First & Middle	Last.	Total.	First.	Middle.	Last.	First.	Middle.	Last.	First.	Middle.	Last.	Total.		
(a) Synchronous observations . . .	.....	.....	.....	.....	9	8	5	5	1	4	1	.....	(5)	33	
(b) Earlier bloomers of 1902.....	.....	2	(2)	3	4	11	11	2	3	2	1	.....	(3)	39	
(c) " " 1903.....	.....	.....	.....	.....	4	3	4	23	25	24	15	.....	(39)	98	
Total number of plants under consid- eration .....	.....	2	(2)	3	17	22	20	30	29	30	17	.....	(47)	170	
Average lead of (b) four days.															
" " (c) " until the middle part of May, when the lead became (in days).....	.....	.....	.....	.....	.....	.....	.....	7	10	9	8	.....	.....	.....	
Average maximum temp. in 1902...	37.1	52	(42.32)	50	54.4	62.8	(55.7)	56.6	65.1	70.3	(64.6)	71.6	71.9	67.1	(70.2)(58.15)
" " " 1903.....	40	45.5	(42)	48.2	54	62.8	(55)	67.7	81.1	70.8	(73)	80.5	67.8	71.1	(73.1)(60.7)

Now, looking more closely, we find that the earlier bloomers of 1902 in April and the first part of May were on the average four days ahead of their sisters (or perhaps I should rather say children) of 1903; indeed, that is also the average of all the earlier bloomers of 1902. But the earlier flowers of 1903, while surpassing those of the same species in 1902 by only this same number of days in the earlier part of the season, yet in the latter part, *i.e.*, after the 10th of May, blossomed on the average between eight and nine days earlier than their representatives of 1902. This means that the season of 1903, which began and continued for a time four days behind that of 1902, rapidly gained twelve days on that season in the middle part of May, and held this position well on into the month of June at least. For I find that the average lead of eight days is pretty constant throughout the four periods from the 10th of May to the 20th of June, being seven, ten, nine and eight days respectively.

To anticipate the objection that these observations, while all of the vicinity of Ottawa, were not always of exactly the same locality for the same species, I selected those of the observations to which this objection could not be taken, and found that the result was substantially the same. The average for the period named is eight days, and for the different parts of that period seven, nine, eight and eight respectively. This indicates that, for example, when a given plant is blooming in Beechwood, it is likely to be blooming in Billings Bridge too; and when you find a certain species in bloom in Beechwood swamp, you may confidently look for it in bloom in Dow's or in the Britannia swamp, if it is to be found there at all. While this may be taken as the rule, there will doubtless be found localities where the conditions of soil or location are distinctly peculiar. Chelsea, for example, is situated on a southern mountain slope some two hundred feet above Ottawa; the spring plants will be earlier there. Blueberry Point, on account of a certain peculiarity of soil and flora, is also possibly an exceptional spot. It is safer to compare such places only with themselves in one's phenological comparisons. When possible, I have always used preferably observations from the same locality, and, in the case of trees, from the same tree.

Sports, also, must be excepted from such comparisons. Of

these I found at least two striking instances. One plant of the common wild strawberry, *F. virginiana*, was in bloom some ten days before its sister plants in 1902, namely on the 11th of April; and on the 17th of April, 1903, I found one Canada violet expanded, while I found no others anywhere till eight days later. Both these plants are still growing and blooming late in the fall; and winter had in this case probably caught both of them in bud. Thus the strawberry, being a perennial, and the Canada violet, protected by the thick snowy garment, acting probably as a winter annual, were both ready to proceed and open their blossoms as soon as Winter released his grip.

To account for the remarkably sudden and rapid advance in the growth of the plants last May, we should naturally infer that there must have been some remarkable phenomenon in the weather of that month. In order, then, to ascertain this accurately and to see whether the conclusions from my observations of the Comparative Phenology of 1902 and 1903 were borne out by the Comparative Meteorology of these two seasons, I, after writing the above conclusions, applied to the weather bureau for a statement of the progress of the weather during the periods named, and particularly of the temperature and rainfall. These were courteously furnished me by the Deputy Minister of Marine.

Comparing first the daily maximum temperature for the two seasons, it came out that while the maximum daily temperature of March was just about the same in both years, namely 42.3° in 1902, and 42° in 1903, yet it was better distributed to stimulate growth in 1902. For, while the first eighteen days were the same in both months, the next two days were unusually cold in 1902 and unusually warm in 1903, and consequently the rest of the month, *i.e.*, the last third, the important part for vegetation, was on an average 6.5° warmer per day in 1902, being 52° in 1902 and 45.5° in 1903. This gave that year a slight advantage at the start, which was seen in the blooming of hepaticas, for example, on the 28th March, 1902, and on the 30th in 1903; and of the silver maple on the 26th in 1902 and the 29th in 1903. This slight advantage in favor of 1902 was increased during the first third of April which was warmer in 1902 by 1.8° per day. During the rest of April, 1902 had a slightly higher average daily maximum

temperature, so that 1902 would naturally retain its lead. But the last four days of this month were on an average considerably warmer (6.7° per day) in 1903, and this continued the case throughout the two following months except in the second part of June.

It was in the closing days of April, therefore, that 1903 began to gain on 1902, and the rapidity with which it overtook and passed 1902 is readily explained by a comparison of the temperatures in May. During the first five days 1903 was only warmer by 1.4° per day, but during the next five days by 18° per day! It was evidently during those five remarkably warm May days that the vegetation of 1903 overtook that of 1902. During the second third of May the days were 16° warmer than in 1902, or almost as much warmer as during the second five days, thus accounting for the remarkable spurt in vegetation in the middle of May, 1903, which my observations showed to exist. That last season's lead should have continued and even increased in the last third of May, is again explained by the fact that the daily maximum temperature during this period was higher in 1903 by $.5^{\circ}$. But, although the temperature was still warmer in the first part of June, 1903, as compared with 1902, by 9° , yet there was a falling off of one day in the lead of the vegetation of 1903. Some other controlling factor seems to have operated here. During the middle part of June the maximum temperature of 1903 was less than that of 1902 by 4° per day. This change is indicated by my observations, which show a lead of eight days during this ten-day period as against nine for the previous period.

The daily *minimum* temperature, though of course not so good an index of plant growth, yet tells in a general way the same story. In both the years under consideration the average minimum daily temperature was below the freezing point up to and including the 6th April. After that date there were only five days in 1902 when the minimum fell to or below 32° , the last time being the 11th of May;* whereas in 1903 this occurred fifteen times,

* It might be pointed out in this connection, that, as the flow of the maple sap through the tap-hole is dependent upon the fluctuation of the temperature above and below the freezing point, or 32° F., the sugar season around Ottawa must have practically ceased on the 6th April in 1902.

the last frost being, however, earlier (the 6th of May) and not severe. The minimum temperature throughout April was also considerably higher in 1902 than in 1903. So that here again we see the early part of the spring of 1902 to have been a more favorable season for growth than that of 1903.

But, while there was very little frost in the spring of 1902, there was one exceptionally severe frost, and that so late as the morning of the 10th of May, when the thermometer went down to 21° above zero. This frost did considerable damage to vegetation and must have retarded growth. One Arbor Day we had planted in the same spot at my school round leaved and red osier dogwood shrubs from Rockcliffe, and they grew luxuriantly. This frost of May the 10th, 1902, nipped the round-leaved dogwood, withering all its leaves, but spared the red osier growing with it. I noticed that it also spared the alder. But, partly, no doubt, because of their nearness to the ground, it played havoc with many herbs. The early lily and lily-of-the-valley families, in particular, were badly wilted and blackened. I found no *Clintonia* in bloom that season, owing, I thought, to the frost.

While in March the minimum daily temperatures ran roughly from 20° to 35° , and in April from 30° to 40° , in May and June they ran from 40° and 45° respectively to 60° . But dividing the months into three periods, it is found that the average minimum temperatures for the three parts are roughly 40° , 40° and 50° in May 1902, but 40° , 50° and 50° in May, 1903; and 40° , 50° and 50° in June, 1902, but 50° , 50° and 50° in June, 1903; showing that the middle part of May and the first part of June were much colder in 1902 and that the month of May, 1903, had about the same minimum temperature as the month of June 1902. This reinforces our previous conclusions regarding the phenomenal growth in May, 1903.

I was struck with the steadiness and evenness of the rise of the minimum as compared with the maximum temperature: a fact due to the constancy with which the earth absorbs heat and the tenacity with which it retains it, as compared with the rapidly waxing strength of the sun's ever more perpendicular rays, much of whose heat, however, is often intercepted and irradiated by

clouds and winds, or absorbed in the evaporation of rain. The average minimum temperatures of every ten days of May and June, 1903, were respectively 37.8° , 51.8° , 51.1° , 52.6° , 51.8° and 53.3° ; while the corresponding maximum temperatures were 67.7° , 81.1° , 70.8° , 80.5° , 67.8° and 71.1° . It was in May that the most rapid rise in minimum temperature took place, namely that from about 40° to about 50° during the middle of May, 1903, and the latter part of May, 1902.

Comparing now the rainfall of the two seasons, we find that there is a marked difference in the amount and still more in the distribution of precipitation. It 1902 it amounted during the four months under consideration to 12.32 in.; in 1903 to 8.97 in. Or, leaving out of account the last third of June, which my plant-observations do not cover, 10.65 in. and 5.06 in.; that is more than twice as much rain in 1902 as in 1903 for the period covered by my observations. In 1902 the rain was well distributed, being for March, April, May and the first two thirds of June 3.47, 2.74, 1.82 and 2.62 inches respectively, which is not very different from the average for 20 years. But in 1903 the figures are 1.35, .95, .12 and 2.64 inches. In 1903, therefore, there was comparatively little precipitation in the spring before June, and next to none in May; and even in June the rain did not fall in any appreciable amount until the 12th, when it rained 1.59 inches and continued rainy throughout the rest of the month. Furthermore, there was no rain in April after the 7th. In fact from the 8th April to the 11th June inclusive there fell only .22 in. of rain! That period, therefore, of over two months' duration, was literally one long drouth. Occurring as it did, however, so early in the year, when the ground was saturated with the winter snows, its effect was, as we have seen, to force vegetation forward rather than to retard it, *until towards the end of the drouth*. For we found that, in spite of the fact that the weather continued warmer, and indeed increasingly warmer in the first part of June, 1903, as compared with 1902, yet there was an actual falling off in the lead of 1903 over 1902 in plant-growth during that period, when the average daily temperature was 7° higher in 1903.

I was not surprised at this result, as I remember noticing the blighting effect of the drouth on certain of our wild plants. I

noticed *Unifolium Canadense* in bud as early as the 29th of April. On the 15th May I have the following note: "Most of the bunches of buds of *Unifolium Canadense* have shrivelled up; others—lately developed probably—are about ready to open, but rain is needed!" The flowers expanded about a week later. This was in Beechwood Cemetery. At Chelsea they came into bloom about a week earlier than here and at the same time as the previous year but not so abundantly. Wild columbine, which already had large buds on the 27th April, seemed to be affected by the drouth, being very slow in opening its buds in May. In the middle of May, 1902, I found plenty of *Capnoides sempervirens* in bloom on the rocks of the island at Chelsea; at the same time last year I could find no trace of the plant. I found *Anemone riparia* in bloom in abundance at the Beaver Meadow very early in June, 1902; last year I did not find it there at all. Several plants found blooming in the lane near the bridge at Beaver Meadow, Hull, in 1902, were not to be seen there in 1903, as *Sedum acre* and *Capnoides aureum*. *Iris versicolor* was abundantly in bloom in the swampy ground near by very early in June, 1902, but not last year. I found *Trifolium aureum* earlier in bloom last June than the previous June, but its growth was stunted. Twin-flower and the pitcher plant were burnt brown by the heat where exposed. The drouth had probably something to do with all these failures.

At the end of April, 1902, I found *Draba nemorosa* pretty abundantly in bloom along the river bank at Tétreauville, and before many days its little yellow flowers covered the ground. Last year I was unable to find the plant at all. The dry spring was probably unfavorable to its growth. Prof. Macoun, to whom I am indebted for much cheerfully given help in this investigation, told me that *Draba nemorosa* had been found only once before around Ottawa, namely in 1900 by himself near the St. Louis Dam. Other rare plants I found in bloom in 1902 are *Cynoglossum virginicum*, 17th June, at Tétreauville; *Symphoricarpos racemosus*, 28th June, at Rockliffe; *Heracleum lanatum*, 28th June, near the mouth of the creek draining Hemlock Lake; and in 1903, 25th May, *Corallorhiza corallorhiza* at Britannia.

It was not the purpose of this paper to compare these two seasons in detail with the preceding. I have also not dealt with

bird-migration, which is another interesting index. Suffice it to say that my plant notes and bird notes, and the weather records kindly furnished me by Mr. Stupart, the director of the meteorological service, alike show these last two springs to have been both unusually early. Both had in March and April almost the same mean temperatures, which were in March 10.9° (1902) and 11.4° (1903) higher than the average for twenty years,* and in April 4.5° (in 1902) and 2.9° (in 1903) higher than the normal. And the hot, dry month of May, 1903, of which we have spoken at length above, was 3.6° hotter than the normal, while May, 1902, was 1.7° cooler than the normal, and June of both years cooler than the average by 4.4° and 2.4° respectively.

Comparing the past two springs with the previous two, we see again how remarkably early they were. The mean monthly temperature of March, in 1900, was 18.6° , in 1901 it was 24.3° , while in 1902 it was 33.9° and in 1903 34.4° . It is little wonder that hepaticas and silver maples bloomed earlier in 1902 and 1903 than in 1900 and 1901. But why they should have bloomed from two to three weeks earlier is not so apparent, when we consider the interesting fact that the *temperature of April was about the same for all four years*. But happily we are not left without an explanation, which lies in the state of the soil. In the falls of 1901 and 1902 snow fell early and steadily before the frost had entered the ground, consequently there was no frost in the ground to retard vegetation when the snow went off in the spring. In the previous two years the conditions were precisely the contrary: the frost got well into the ground before the frost came, so that the succeeding springs of 1900 and 1901 were much retarded not

* These mean temperatures are somewhat higher than that of March, 1898, which was the warmest March of which we have any record prior to 1902, its average maximum temperature even exceeding those of the Marches of 1902 and 1903 by a small fraction of a degree, being 42.36° . Miss V. Lees informs me that she found hepaticas in bloom on Pine Hill, New Edinboro', on the 27th of that month, which is the earliest record for hepaticas of which I have heard. While this article is printing I am able to state that this spring hepaticas have not, so far as I know, been found in bloom earlier than the 16th April, and up to to-day (23rd April) I have seen no other wild plants in bloom. Till to-day the temperature has not reached 50° . One swallow does not make a summer, nor one hepatica a spring!

only by the slowness with which the snow melted in those cold, ice-bound Marches, but also by the frost in the ground under the snow tending to delay growth.

It is not to be expected that two springs so unusually early, two Marches of so remarkably high a temperature, will be followed by a similar one. One of the conditions that make for the early growth of plants is certainly present. I have found, by digging down through the three feet of closely packed snow and ice in the woods, that the ground there is not frozen though it is in the open field. Therefore, when the snow disappears, or, indeed, before that, plant-growth will be possible in the woods. But the snow this year is of unusual depth,* and will be longer in melting, not only because there is more to go, but because the very presence of such a mass of frozen matter makes for lower temperatures. It is probable, however, that when spring does come it will come in with a rush and be a rapid season. For with temperature, as with other things, there is always a tendency to rhythm, to wave-motion ; so that, as we are having temperatures so constantly, so phenomenally low this winter, we may expect unusually high temperatures later on. Although a cold winter does not always presage a warm spring (it did not in 1875, the coldest winter on record, nor in 1883, nor in 1885), yet it is not usual, Mr. Stupart informs me, to have more than three consecutive months below normal. In dealing with the weather, however, it is certainly easier to be wise after the event. Long forecasts regarding the weather, indeed, partake rather of the nature of guess work than of true prophesy. The conditions affecting weather are so numerous, complex and remote, as to make meteorology the most difficult and the most backward of all sciences, not even excepting physiology.

Finally, comparing the spring drouth of 1903 with previous drouths at that season, we see how phenomenal it was. Mr.

* As this article is being printed, I have ascertained the snowfall of the past winter to be 105.7 inches, which is 8.8 inches above the average for thirty years. Even this heavy snowfall did not everywhere protect the ground in the open during the past severe winter. The snowfall of the previous winter was unusually light, being but 72.9 inches.

Stupart has kindly furnished me with a record of the dry April-May periods of the past thirty years. They are as follows :—

1876—	2.15	inches of rain.
1879—	2.64	"
1896—	3.10	"
1898—	3.21	"
1900—	3.76	"
1903—	1.07	"

It is certain, therefore, that the drouth of 1903, lasting from 8.h April to 11th June, during which only about a fifth of an inch of rain fell at Ottawa, is easily the driest spring on record. It is remarkable how little harm it did, which shows how well fitted our finely watered district is to withstand drouth. As an instance, however, of the fact of compensation, of the fact that things do tend to average up, it is worth mentioning that, in spite of the long drouth in the Ottawa Valley last spring, the precipitation here for the year 1903 was only one inch below the average mean of 33.6 inches; and the additional fact that in revenge for the unusually hot May we had an unusually cool summer. The hottest day last year was the 19th of May, when the thermometer registered 90° in the shade. The average annual maximum temperature of Ottawa is 93.8°. July, which, as is usually the case, was the hottest month, exceeded May in average maximum temperature by only 3.7°. August had a lower maximum than May.

It is well known that plant growth is dependent upon meteorological conditions and particularly upon temperature and rainfall; but that the dependence is so absolute, that the parallelism is so true and delicate as even these few observations with all their liabilities to error yet indicate, was to me very interesting and gratifying: interesting as the spectacle of the orderly reign of law must be to everyone who studies it; and gratifying, as proving that my observations, which I was, to tell the truth, a little fearful of putting to the test, must have been fairly accurate.

Such a study tends to clarify one's ideas regarding many interesting phenomena. That the plants, instead of all springing up together at the first blush of spring, should range themselves, so to speak, in a procession throughout the season, is partly due

to their varied sensitiveness to heat, as well as to their more or less favorable situation for receiving the heat. The sensitiveness of our wild plants to heat has been determined in very few cases. In our hemlock, the lowest temperature at which the chlorophyll-corpuscles turn green is between 44.6° and 53.6° F. The decomposition of carbon dioxide with evolution of oxygen begins in ~~potomogeton~~ between 50° and 59° , and in the eel-grass above 42.8° . Even the most sensitive, *i.e.*, the most prompt to react in this way, as the larch and meadow-grass, require a temperature above the freezing point, between 32.9° and 36.5° in the case of the larch, and between 34.7° and 38.3° for the meadow-grasses. From our observations we might reasonably infer that silver maples, hepaticas, spring beauties and the trailing arbutus, all of which have been found *blooming* in March in one or both of the last two springs with a maximum temperature of about 50° , rank with these in readiness to react to heat stimuli; while golden-rod, asters and indeed most of the Composite family must require a great deal of heat. On the 6th of April, 1903, after several cool days and frosty nights, I have this record: "Still cool and cloudy; no growth." In going about the streets and the woods I had noticed little or no change in the vegetation those days. The aspen and alder catkins, which I noticed well shaken out on the fifth, did not begin to shed pollen until the ninth, which was a fine mild day, the temperature reaching 56° . The habit of the plant as regards the order of growth of stock leaves and flowers is another factor conditioning the time of blooming. Plants such as the hepatica, trailing arbutus, early coral-root, silver maple, alder, aspen, hazel, and glaucous willow, which in the spring devote their new-found energies of growth to the unfolding of flowers-buds already formed the previous year, will naturally bloom early; while those which, like the golden-rod and oak and ash, attend first to the growth of stock and stem and leaves will naturally bloom relatively late.

A word might be said here regarding the time when the various orders and families of plants come into bloom. During April in these two exceptionally early springs I found 75 species of plant in bloom, including two grasses and six sedges. Leaving out of consideration the sedges and grasses, which I observed

only in April, I find that the chief blossoming-time for our flowering plants is the end of May and the beginning of June. During the last third of May and the first third of June I found 136 plants coming into bloom, or exactly 68 for each period. This is about 40% of the whole number found blooming before the end of June. In every ten-day period before this, the numbers gradually increase towards this climax, while they fall off thereafter. I found no violets come into bloom after May and very few of the lily and lily-of-the-valley families; they are found from the middle of April on. On the other hand the St. John's Wort family, which belong to the same order as the violets but have a different habitat, come into bloom in July. The poppy family has some April representatives. The poplars and willows, elms and maples bloom early; indeed most, if not all, of our trees are in bloom before June. The irises and orchids do not bloom before May. The order of the *Ranales* and the rose order begin to bloom early and furnish a great number of species, perhaps 80% of their number, throughout April, May and June, beginning with the hepatica, our earliest flower. Much the same may be said of the cress or mustard family (which begins with the cut-leaved toothwort) and the heath order (beginning with the trailing arbutus, almost, if not quite, as early as the hepatica) though they are not quite so abundant in the beginning. The cress family may nearly all be found in bloom before the middle of June, while quite a number of the heath order bloom in July. The pink family and the umbel order have each only one representative in the latter part of April, viz., the larger mouse-ear chickweed (*Cerastium vulgatum*) for the former, and the dwarf ginseng for the latter; but soon after they become very abundant, especially the umbel order. The more highly developed plants seem to be, as a rule, poorly represented in the spring, being largely summer bloomers, which would suggest that their greater complexity required time to unfold. I refer to the primrose, borage, mint, potato and figwort families, the gentian order, and especially the great order of the *Campanulales* which includes the numerous *Composite* family. Of the *Rubiales* I found only one species of galium blooming in May, but six in June; *mitchella repens* also is not found till towards the end of June; but the honeysuckle family, while furnishing but one plant

blossoming in the latter part of April (the 30th), furnishes many in May and June. The earlier plants of spring are mostly woodland or (generally rather later) swamp plants ; which, not requiring much heat, find the moist and shady woods or the cool, wet swamps a favorable habitat. Such are, for the woods, the violets, the lilies, the early poppies, the saxifrages and mitreworts, strawberries and hepaticas ; and for the swamps and wet places, many orchids, irises, cresses and speedwells, etc. Towards the end of spring the flower-lover will find the woods comparatively bare of flowering species and will turn to the sunny shores of lake and river, both in the water and on land, where will greet him water plants of many kinds, and spiræas, button-bush, St. John's wort, loosestrifes, bluebells, epilobiums ; and to the clearings, the fields and roadsides, where he will find roses, raspberries, peas and clovers, and finally mallows, mints, gerardias, lobelias, gentians, thistles, beggar-ticks, sunflowers, golden-rods, asters, and in short all those highly-developed plants which delight to bask in the direct rays of the sun.

The weeds, with very few exceptions, are late bloomers, which may be explained by the fact that they are mostly annuals, springing from the seed which has lain dormant until awakened by the warmth of spring. There is therefore considerable growth necessary before flowers can be produced and this takes time. The following weeds, however, I found blooming in April : the European strawberry, shepherd's purse, Buxbaum's speedwell and the dandelion. Of these the strawberry and dandelion are perennials that bloom continually throughout the season, and only suspend growth while the unfavorable winter conditions last. They are therefore ready to go on blooming early in spring. The shepherd's purse is a winter annual, germinating and vegetating in the fall, and so ready likewise to bloom early in the spring. The other weed that I found blooming in April, namely Buxbaum's speedwell, may possibly also have acted as a winter annual.

I might add that having found plants in bloom in March and well on in November, there are only three months when one need never look for wild flowers around Ottawa, viz., December, January and February. And I am not so sure that dandelions, or sweet clover, or *Linaria linaria*, popularly known as butter-and-

eggs, might not be found still blooming at the beginning of December some very late fall in favorable situations. But the only way to see our wild plants in bloom in the middle of winter is to dig them up and bring them home in the fall. I have got sweet cicely to bloom in this way, and my pupils were able to have hepaticas and spring beauties in flower at Christmas-time,—a charming little bit of the spring woods ! It can not be said of all Canada, however, that wild flowers never bloom in February in their own habitat; for on the British Columbia coast, under the influence of the warm Pacific current, at Chilliwack and Vancouver for example, spring opens in the latter part of February with the blossoming of willows and alders ; while on Vancouver Island there is hardly any cessation of growth at all during the winter, and a great many species of wild plants may be found blooming in February.

That seeds long dormant should suddenly germinate and grow luxuriantly when the frost cover is removed, is doubtless due to the great amount of heat, and possibly light, necessary to the germination and growth of these plants—an amount that does not exist in the shade of the poplars, spruces and pines. When these trees grow up again, the heat-loving willow-herb and golden-rod, blueberry and raspberry die away, leaving their seeds, or in some cases the roots, to represent them and to assert their rights when the proper heat-stimulus is again present. The need of oxygen for the germination of the seed is also a factor here. The clearing away of forest cover allows a freer circulation of air, and the oxygen in the air has a better chance to come into contact with the dormant seeds.

Finally, it would appear from this study that the vegetation of a given region would be just as true a criterion of its climate as the climate would be of its flora. They are converse propositions. And plant-growth, being really the resultant of the complex conditions making up what we call *weather*, is thus a very simple and beautiful index of the progress of the seasons.

February, 1904.

MEETINGS OF ENTOMOLOGICAL BRANCH.

Meeting No. 11 was held at Dr. Fletcher's on January 14th, 1904; seven present. Dr. Fletcher explained that the meetings had been interrupted for several months, owing to absence of members and to other causes, but that in resuming them it was recognized that they were of much value to the members, upon whom he called to set forth the results of their past season's collecting and observations. Mr. Gibson read a paper on "An Interesting Enemy of the Iris," in which he described the larva of *Macronoctua onusta*, which had infested the stems of irises at the Experimental Farm. Dr. Fletcher instanced, among such stem-boring caterpillars, the larva of *Gortyna purpurifascia* which had in a previous season greatly infested their columbines. Mr. Gibson said that larvæ of the rare *Apantesis superba* (var. *nevadensis*, Dyar's List) had been received from Vernon, B.C., and had been successfully reared. Of six caterpillars, two had been inflated and four bred to the moth. Larvæ of *A. docta* (var. *arizonensis*) had also been received from Phoenix, Ariz. Dr. Fletcher spoke of the value of the chitinous head-case of some larvæ as of even greater value than the skin in determining the number of the moult of the caterpillar. In reply to an enquiry by Dr. Sinclair as to the chief value of breeding these forms, he explained that one of the principal aims of such studies was to ascertain that stage in the life of the insect in which injurious forms might be most easily and economically destroyed. The habits of various cutworms were mentioned, and the remedies, such as bunches of poisoned weeds, etc., which might be applied to check their depredations. Mr. Metcalfe exhibited a collection of Homoptera, chiefly the smaller leaf-hoppers, which he had made at Brockville during the summer. There were about forty species named by Mr. Van Duzee, and many of these were represented by long series of carefully mounted specimens. He also showed samples of the curious little Chrysomelid beetle, *Exema dispar*, which is obtained from goldenrods by using a sweeping or beating-net, and which probably escapes many enemies by its marked resemblance to the excrement of caterpillars. Mr. Baldwin showed the results

of some recent outings, among which was a *Bombus ternarius* impaled upon a thorn by a shrike. Dr. Fletcher described the success which he and Mr. Gibson had attained in breeding the rare moth *Apocheima rachelæ*. Two of the hairy wingless females were shown alive, and mounted examples of the delicately colored, winged males, with inflated larvæ in all stages. The various stages of *Leucobrephe muddendorfi* were also shown. Dr. Sinclair spoke of the opportunities afforded to naturalists by the country surrounding his summer residence in Muskoka, and some discussion followed on the flora and fauna of that region, and on the occurrence of rattlesnakes in Canada. Dr. Fletcher briefly outlined his summer lecture tour in Manitoba, the Territories and British Columbia. The ascent of Mt. Cheam had been a disappointment, as unusually bad weather prevented any effective collecting. A couple of days were passed at Kaslo, B.C., where Dr. Dyar with two assistants had spent several weeks, making large collections of lepidoptera and breeding about 200 species. The new Moth Book published by Dr. Holland was examined and much admired by the members.

SUB-EXCURSION.—The first outing of 1904 took place on Saturday, January 23rd, at the Experimental Farm, when eight, including two ladies, turned out on snow shoes, to see how things appeared in mid-winter. The tramp was through the arboretum to the canal, returning by a circuit again through the arboretum. The great depth of snow offered little chance for collecting, as all smaller forms of vegetation were buried, and the finds were limited to some cocoons and galls. A very pleasant and instructive hour was passed, however, in examining the trees, and appetites were sharpened to do justice to a good hot supper prepared by the host and his assistant.

MEETING NO. 12 was held at Mr. Harrington's, on Jan. 26th, 1904; five present. Mr. Gibson read an interesting paper entitled "A Night's Collecting at Meach Lake," descriptive of a visit paid by him to Mr. Young during the summer, and mentioning some of the most important moths which had been taken at sugar and light. The neighbourhood of the lake has always

proved productive to all naturalists who have attended the Club excursions, and Mr. Young during two summers spent there has made extensive collections. Fourteen species of the rarer moths were shown. Mr. Metcalfe exhibited a neatly mounted collection of flies, mostly small species, consisting of about 500 specimens, which he presented to Dr. Fletcher, for the museum of the Experimental Farm, to the collections in which it will be a valuable addition. Mr. Harrington showed two large pupal cases, apparently of a *Hepialus*, which he had taken from an old maple tree on the Aylmer road. He also exhibited two boxes of insects in various orders taken during 1903, and containing several species as yet undetermined. Dr. Fletcher exhibited a female *Mantis carolina* which he had kept living for some time and whose rapacious habits he graphically described. Mr. Harrington referred to a larger species, equally voracious, which he had frequently observed in Japan. Mr. Baldwin showed some galls from willows and raspberry.

MEETING NO. 13.—Held at Mr. Gibson's on February 10th, 1904; eight present. Mr. Baldwin showed some recently collected cocoons of moths, also of the sawfly *Trichiosoma triangulum*, and of spiders. Mr. Metcalfe submitted a list of 43 species of hemiptera, representing 34 genera, taken at Brockville, Aug.-Nov., 1903. Mr. MacLaughlin stated that, while unable to do any collecting, it appeared to him that there was an unusual scarcity of dragonflies last year, due probably to the excessively dry spring. Dr. Fletcher referred to the immense swarms of a species of *Gomphus* which had appeared in Ottawa some years ago, and which had not since been observed in any special abundance. He also spoke of the myriads of dragonflies seen by him last summer upon the North-west prairies, chiefly *Diplax rubicundula* and *D. costifera*.

Mr. Harrington exhibited a case of Ottawa Buprestidæ, containing about 40 species of these destructive beetles, and read a paper giving the dates of appearance and notes on the habits of the various species; regarding the majority of which much is to be learned. Dr. Fletcher had found *Buprestis langii* abundant in the upper country of Alberta and British Columbia upon the

bracken fern. He also reported that a species of *Agrilus* had recently become a serious enemy to the birch. A white birch tree near his house had been killed apparently by this insect, but as the beetles emerged during his absence he had obtained no specimens. Mr. Harrington thought it might be *A. obsoletæguttatus*, of which both sexes had been taken upon birch. Some discussion followed as to the duration of the larval stage of Buprestidæ and on retarded development in these and other insects, due to deficient heat, moisture or food, or to causes not yet understood. Mr. Young showed a hawk-moth, *Cressonia juglandis*, and described a curious crepuscular flight of the males, which he had observed at Meach Lake; the moths flying too and fro across a patch of smooth water and repeatedly dipping the tip of the abdomen in the water. He also showed *Thecla læta*, a little blue butterfly, new to the Ottawa list, and which is a well known cotton pest in the Southern States. Dr. Fletcher exhibited, as a really rare insect, the fine moth *Hepialus thule*. This species was described from a specimen taken some years ago at Montreal, and so far it has not occurred elsewhere. It is stated to fly only between 8 and 9 o'clock, p.m., during the brief period of its winged existence. Dr. Fletcher also read some extracts from proofs sheets of the Entomological Record for 1903 (Rept. Ent. Soc. Ont.), which indicated that entomologists, especially in the Western provinces, had made many good captures during the year and had largely added to our knowledge of Canadian insects. Mr. Gibson said that in 1991 eggs of a then undescribed arctic moth had been received from Mr. Cockle of Kaslo. Last year similar eggs had again been received and the moths had been bred. Dr. Dyar had also bred the species at Kaslo and had named it *Diacrisia kasloa*. Inflated larvæ, pupæ and five imagos were exhibited.

W. H. H. (Sec.)

MEETING OF THE BOTANICAL BRANCH.

The first meeting in the new year was held at the residence of Mr. A. E. Attwood on January 7th. Those present were Dr. J. Fletcher, Prof. J. Macoun, Dr. C. Guilett, Mr. E. R. Cameron, Mr. W. T. Macoun, Mr. R. B. Whyte, Mr. J. M. Macoun, Mr. D. A. Campbell and Mr. Robert Hamilton.

By special request Mr. W. T. Macoun read a very graphic description of a trip made by him several years ago up Mount Arrowsmith, Vancouver Island. The reading of the paper was followed by some very interesting and amusing reminiscences by Prof. Macoun and Dr. Fletcher, who have also made the ascent of this very picturesque mountain.

Mr. E. R. Cameron read an extract on "Weeds" from John Burroughs' "Pepacton" in corroboration of what Prof. Macoun had stated on that subject at the previous meeting.

"It is a fact," writes Burroughs, "that all our most pernicious weeds, like our vermin, are of Old World origin. . . . We have hardly a weed we can call our own; I recall but three that are at all noxious or troublesome, namely, milkweed, ragweed and golden-rod."

Some time was spent discussing a question asked by the chairman: "Why are the plants of my window-garden not thriving better?" Lack of success with potted plants in an ordinary living-room may be due to unsuitable soil, injudicious watering, dryness of the atmosphere, the presence of dust and insects on the plants, insufficient sunlight, inadequate development before bringing into the house, or worms in the soil.

As an outcome of the discussion on the management of potted plants, it was decided to prepare a list of books that would be of assistance to the amateur and professional lover of plant life. The following may therefore be considered as a select bibliography of guides in the identification and cultivation of plants.

I.—BOTANICAL KEYS.

An Illustrated Flora of the Northern United States and Canada. Britton and Brown. 3 vols. \$9.

Field, Forest and Garden. A Simple Introduction to the Common Plants of the United States east of the Mississippi—both wild and cultivated. Asa Gray.

Manual of the Flora of the Northern States and Canada. Nathaniel Lord Britton. Ph.D. 1080 pp. \$1.50.

Manual of the Flora of the Northern States and Canada. New edition. (In preparation.)

II.—POPULAR BOTANICAL GUIDES.

Our Northern Shrubs and how to Identify them. Harriet L. Keebler. 500 pp. 240 ill. \$2.

Handbook of the Trees of New-England with Ranges throughout the United States and Canada. Lorin L. Dame and Henry Brooks. 200 pp. \$7 plates. \$1.

Trees, Shrubs and Vines of the North-eastern United States. H. E. Parkhurst. 250 ill. \$1.50.

Our Native Trees and how to Identify them. Harriet L. Keehler. 500 pp. 340 ill. \$2.

Studies of Trees in Winter. A Description of the Deciduous Trees of North-eastern America. Annie Oakes Huntington. 190 pp. 80 ill. \$2.50.

A Guide to the Trees. Alice Lounsberry. 312 pp. 64 col. ill, 164 bl. & wh. ill. 54 dia. \$2.

Nature's Garden. An Aid to a Knowledge of Our Wild Flowers and their Insect Friends. Neltje Blanchan. 400 pp. 80 ill. \$3.

How to Know the Wild Flowers. Frances Theodora Parsons (Mrs. Dana). 48 col. ill. \$2.

A Guide to the Wild Flowers. A description of 500 plants. Alice Lounsberry. 347 pp. 64 col. ill. 100 bl. and wh. ill. 54 dia. \$2.

Mushrooms, Edible and Poisonous, with recipes for cooking, and the chemistry and toxicology of mushrooms. Prof. Geo. F. Atkinson. 320 pp. 230 ill. \$3.

The Mushroom Book. Nina L. Marshall.

Our Ferns and their Haunts. Willard Nelson Chute. 332 pp. 200 ill. \$2 15.

How to Know the Ferns. Frances Theodora Parsons (Mrs. Dana). 150 ill. \$1.50.

Ferns. A Manual for the North-eastern States. C. E. Waters, Ph.D. 362 pp. 200 ill. \$3.

Sylvan Ontario. A Guide to our Native Trees and Shrubs. Dr. W. H. Muldrew, B.A. 131 leaf-ill.

III.—WORKS ON PLANT CULTIVATION.

The Window Flower Garden. Julius J. Heinrich. 120 pp. Illustrated. 50c.

Home Floriculture. A Practical Guide to the Treatment of Flowering and other Ornamental Plants in the House and Garden. Eben E. Rexford. 300 pp. 72 ill. \$1.

Garden-Making. Suggestions for the Utilization of Home Grounds. L. H. Bailey. 417 pp. 256 ill. \$1.

How to Make a Flower Garden. A manual of practical information and suggestions. A charming book by experts on every branch of the subject. 370 pp. 200 ill. \$2.

NATURE STUDY—No. XIII.

NATURE STUDY IN THE WINNIPEG SCHOOLS.

By J. B. WALLIS, Supervisor of Nature Study. Winnipeg.

For some years there have appeared on the Programme of Studies for Manitoba a number of suggestions as to subjects which might be classed as Nature Study. Such was Agriculture, which took the forms of a small box of chemicals and of colored plates of some common Manitoban flowers and weeds. These had a definite value ; but the teachers did not know exactly what was required of them, and too often the experiments in agricultural chemistry were allowed to degenerate into an hour's amusement; and the colored plates were put away in a drawer, or were used to decorate the school walls. It is safe to say that Nature Study as we know it to-day, had then no place in the work of the schools. In a few cases, a teacher, herself enthusiastic, would arouse the enthusiasm of her pupils about Nature ; but, even then, it was usually done with little thought of the curriculum. The trouble was, the work was too indefinite ; and it remained for the committee which completed its labors last year, to place on the Programme of Studies a series of definite topics which covered the whole range of the subject as understood by its most advanced advocates.

Even then, the troubles had by no means all disappeared. The teachers were frightened of the work. Arithmetic, history, etc., they could teach ; but this new work, which they were not to *teach* was, even with its assigned topics, something altogether different.

The Winnipeg School Board realized this, and appointed a supervisor of Nature Study for one year. In that time, they considered the subject should be on a firm basis and the teachers all able to continue the work without further supervision.

The plan was inaugurated last September, and a valuable fortnight was taken up in finding what had already been done in the schools and what material was within reach. Programmes were drawn up, meetings of teachers held and the topics and purposes of the work explained. The main purposes kept in view

were : (1) Interest of the pupils in their surroundings ; (2) Training in self dependence ; (3) Knowledge.

(1) It was felt that, without interest, the very life and soul of the work would be lost ; so, all first efforts were directed towards this end. If the pupils were interested, observation would naturally follow. Few people realize how blind the majority of us are.

(2) Training in self dependence was believed to be one of the greatest values of Nature Study. In other subjects, books may be used, the teacher may help ; but the very essence of Nature Study is that it is the pupil's own eyes and brain that do the work ; it is all first hand, so that this value has been considered almost more than any other.

(3) While fully realizing the value of the knowledge to be gained, it was deemed advisable not to accentuate this too much. The teachers were already inclined to lose sight of the other values and consider only this, which was so much more in line with the usual school work.

Keeping these purposes in view, each monthly programme was made as varied as possible. The more varied the subjects, the more chance of appealing to the individual pupils and of interesting the teachers. And, further, the design was to arouse the pupils' interest in their whole environment.

The following outline gives a few of the topics on the programmes, with the reason for their appearance and the suggested methods of taking them up.

(a) Flowers and Seeds. This was meant to give the pupils a speaking acquaintance with a few of our common fall flowers. Seeds which had special means of dispersion were collected, and during the winter were discussed with the classes, attention being directed to the clever ways in which mother plants distribute their seeds. Common fruits were also studied. This proved a delightful topic with the children, who doubtless will watch the plants during the coming summer with great interest.

(b) Animals. The study of animals was taken up by all grades up to the sixth, but from very different standpoints. In the junior grades, the object was to interest the pupils more fully in the habits and care of domestic animals ; in the senior grades, in the relation of the animal to its environment ; and the chief object was the preparation of the pupils for the fuller study of adaptation in spring. This work proved exceedingly interesting, and, among the older pupils, much individual observation work was done and many hypotheses advanced to answer questions suggested by themselves.

(c) **The Moon.** The great purpose of this topic was to show pupils that by thoughtful observation many interesting problems could be solved, and to stimulate them to find out about some of the wonders of creation which are so often taken as matters of course. The pupils were to make observations and drawings, and then by wise questions the teacher was to lead them to suggest causes for the apparent double motion of the moon and for its change in appearance. This topic proved both a brilliant success and a dismal failure. In a few cases it was simply astonishing how readily the pupils—without being told anything—came to a clear understanding of the motions and phases of the moon, but in others very little was accomplished. On the whole, while the chief object was not always attained, so much interest was aroused that no doubt the moon will be looked upon by the pupils very differently in the future.

(d) **Evaporation and Condensation.** An effort has been made to arouse wonder in the children's minds, so that they may desire to understand all they see. Thus when it snows, the wish to know why it snows, where snow comes from, how it got there, and many other queries would naturally arise. These studies were taken up in order that such questions should be answered. The results were fairly satisfactory, though in a few cases the desire of the teacher to tell, worked somewhat against complete success.

(e) **Stars.** The senior grades were helped to find a few of the prominent constellations and to recognize some of the brighter stars. This proved most successful. The purpose was to arouse interest and the pupils, on the whole, were delighted with the work. It was almost amusing, too, to notice how the teachers seized upon this topic as something they could do, something tangible, something requiring explanation; and, with this, the poorest Nature Study subject we have taken up, they felt quite at home.

From the above an idea of what we are attempting may be gathered. During the coming months we hope to do a great deal of most interesting work. Birds, flowers, insects, the weather, and much else will receive attention. Special work will be: seed germination and experiments on the growth of plants; insect study, such as of the ant, with experiments suggested by the pupils; a flower-growing competition, and, not least, aquaria-keeping, with particular study of such creatures as mosquitoes, dragonflies, toads, and almost anything which the class may propose.

Having now touched upon what has been done in our schools, it may be well to mention some of the difficulties that had to be faced.

First came the question of time. The curriculum seemed already crowded. Other work showed results which could be seen ; Nature Study was so entirely a matter of attitude that naturally there was a strong temptation to let it, if anything, be left undone.

Then, in the teachers themselves some difficulties arose. It was hard for them to forget the habits of years and cease to regard knowledge as the chief object of education. They wished to give information and when directed not to tell too much, in some cases went to the opposite extreme and did not even guide, but turned their classes adrift. Their lack of knowledge troubled them, and in a few instances topics were shunned for fear the pupils might ask questions which they could not answer. In spite of these difficulties, however, the teachers have done remarkably well ; and I must express my admiration of the Winnipeg teachers as a body, for having taken up so well, work which was completely foreign to all their traditions.

Another difficulty arose with the pupils, in a few cases. They thought they knew all about the topics suggested. "Fancy studying a cat !" They had had one in the house for years. A very little trouble showed them how much they really knew.

Another difficulty was the "parent who didn't believe in such nonsense as studying a butterfly's wing." We heard of a few parents who objected to the work and at the same time showed a consummate ignorance of all about it. However, I am glad to say we received from the parents more encouragement than the reverse.

Last of all arises the question : "What results have been attained?" It is too soon to answer such a question when it is remembered that the work has for its end, not the mere acquisition of knowledge, but the development of interest and mental power ; still, I think that results can be seen, for I have asked many times : "Do you see any results?" and have received such answers as : "They see much more;" "They see things they would never have seen before and are always asking questions about something." Surely interest and faculty for observation are things worth working for, and, to those who ask for knowledge as a result, many things can be pointed out as having added to the pupils' stock of facts. We have four months more to work in. If at the end of that time we can feel that the pupils as a whole are a little more interested, sympathetic, observant and self-reliant ; and if they realize better that in all things, great or small, animate or inanimate, there is something wonderful, something worthy of study, then indeed our work has not been in vain.



To illustrate Mr. Lambe's Paper.

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CONTENTS.

	PAGE
1. Nesting of some Canadian Warblers, by Wm. L. Kells . . .	65
2. Ornithology, a White Pelican at Manotick	71
3. My Birds and how they came to me	73
4. Sub-Excursion to Blueberry Point	75
5. Botanical Notes	76
6. Nature Study—No. 14	77

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No. 3

NESTING OF SOME CANADIAN WARBLERS.

By WM. L. KELLS, (Third paper.)

THE MOURNING WARBLER.

(*Geothlypis philadelphia*.)

The mourning warbler though not abundant in any district, is yet pretty widely distributed over the province of Ontario, as well as other divisions of eastern Canada, but it is among the last of the family to announce its vernal advent amid the wild scenery of its summer haunts. Usually, when the expanding buds of the lower underwood are bursting into leaves; when the yellow bloom of the leatherwood scents the spring-time air, and the virgin soil of the forests being variegated by the early wild flowers of the season; the observer of bird migrations, if in the vicinity of its chosen summer home, will be enabled by the sound of its song, to add to his list, this species as among the more recent arrivals from the sunny south; but as the month of July advances, its nesting period is over; its notes for the season are silent; and the bird itself appears to be among the first of the members of its family to take its departure from the uncultivated scenery of its summer home; and begin its aerial voyage towards its tropical winter residence in the regions of Central America. Here it enjoys the pleasure of existence amid perpetual summer, during that portion of the year when its Canadian father-land feels the chilly breath of the ice king, is covered with a mantle of snow, and swept by the wild storms of winter. In March it begins its northward journey, but two months pass away before it reaches the terminus of its winged voyage in the regions of its northern range, and summer home, and here begins again one of the chief objects of its migration movements *i. e.* the propagation of its species, and when the period in which this can only be done is over the impulses

to return towards the south seem strong, and to yield to the impulses of nature in this matter is not long delayed; for by the middle of September, if not earlier, all this species—and its genus have disappeared; though some individuals may linger longer amid the scenery of their summer haunts in the thicket and the swamp, than is now known.

The haunts and home of the mourning warbler, during the period of its residence in Canada, are generally on the margins of low-land woods, or second-growth swamps, where there is an intermingling of young underwood, fallen brush, and raspberry vines. It may also occasionally be found to frequent wooded ravines, the sides of brush-covered hills, and the margins of muddy creeks which meander their courses through what are called "beaver-meadows," where there is deep concealment; and here, amid the deep foliage, one strain of the song-notes of the male of this species, may often be heard, in the mid-summer days, while the little performer itself is invisible. At times he will rise to a considerable elevation, and after a pleasing performance of quite a different series of musical notes, in the ventilation of which he appears to take much pleasure and pride, and during which he makes a rain-bow like circuit, and takes a rapid descent into the thicket below, near where it is probable the female has a nesting place. Another particular haunt of this bird is small clearings in tracts of hard-wood forest, and along the sides of road-ways, through primitive woods: but it is seldom observed out in the open fields, except in the backwood settlements, nor does it often approach the garden or other environments of human habitations, and except where the woods are open, it will not be found deep in the forest, but as the original forests of Southern Ontario are fast disappearing, time will no doubt effect great changes in the summer haunts of this species. In eastern Canada the mourning warbler does not appear to advance further north than the Gulf of St. Lawrence, and the valley of the Ottawa river; but in the western portion of its range—which extends to the foot-hills of the Rocky Mountains—it appears to extend its summer range to more northern latitudes, and higher altitudes than in the east.

Too little is yet known of the nesting history of this warbler to enable the investigator to decide whether it deposits more than

one set of eggs in the breeding season: certainly its nesting period in Canada would not allow of it raising more than one brood during its stay in this country, but where the first clutch of eggs is taken, it will doubtless nest a second time. But, considering the many enemies among the smaller mammals, birds of prey, and reptiles, to which its eggs and young are exposed, it is doubtful if even one brood is raised by the majority of the pairs that cross our national boundary with each return of spring; even in the most protected localities; though the progress of civilization is rather in favor of its increase, except from the presence of the domestic cat; and yet it is wonderful how some nests of our garden—frequenting birds will escape the attention of this feline foe. The chief protective means resorted to by this species is by selecting a deep shady spot, either among the thick herbage, vines or young underwood, on, or near the ground; and then, after incubation has begun, and when the female becomes aware of danger, she does not fly directly from the nest, but quietly runs off among the surrounding shade, and does not take wing till some distance away, nor does she return to her charge till she thinks the danger is over. These efforts to protect her progeny, are, so far as human kind are concerned, so successful that very few of its nests are ever discovered; and its eggs are, and are ever likely to remain, a rarity in oological collections, but the case is very different with the lower orders of carnivorous mammals and snakes which are ever on the search to find and devour the eggs and young of every species that comes within their reach. In this charge the red squirrel, the chipmunk, the weasel, the mink, the skunk, and the fox, are among the chief transgressors that range the haunts of the warblers, while, nearer human habitations, cats, rats, and even mice, do their deadly work; and no enemy of all the warbler family is more to be dreaded than the vagabond cow-bird.

During the past twenty years a number of the nests of the mourning warbler have come under my observations, and the finding of these has been rather accidental than the results of continuous field and forest research; but the last of these noted up to the end of the season of 1902, is the first to which attention will here be directed. On the 8th of June, 1902, when strolling across a piece of recently cleared fallow, now over-grown with raspberry

vines, on the northwest corner of *Wildwood Farm*, a small bird flushed out from a thicket of vines within a few feet of where I was passing. A little research revealed a new-made nest, which I inferred belonged to a mourning warbler; though at the time I had got only a glimpse of the builder; yet, though all the members of this genus of the warbler family compose nests, and deposit eggs much alike, there is always some variation on the part of each species, by which the attentive student of bird architecture can distinguish the owner, even in most cases without seeing the bird, much less without resorting to the crime of murdering the mother, and in this section of country I know of no other member of the family except the Maryland yellow-throat that nests in a similar manner and situation; and even between these near relatives there is a distinguishing difference which will be noted hereafter. This nest was not sunk in the soil, nor yet in the herbage in which the builder evidently desired to conceal it; but its foundation rested on some dry vine stalks elevated a few inches above the ground; and the first strata was formed of dry leaves and vine stalks placed loosely over each other, and not pressed down in the centre, as is the manner of the *Marylander*. On the top of this mass of dead leaves and stalks, and partly supported by the growing vines, the nest proper was placed. This was quite compactly put together, as though the materials were damp with rain, or the morning dew; when used by the builder, and may have been further moistened by the saliva of the bird when engaged in placing the particles together. The materials used were mostly dry leaves, fine fibres of vine stalks, rootlets, and some cattle hair. The inside was about two inches in diameter, by one and a half deep, the top of the nest was quite open, there being no artificial attempt at concealment, as is the habit of the Maryland yellow-throat. Six days after, I revisited this nest, the mother bird was at home and on flushing she did not rise on the wing, but ran off among the herbage in a mouse-like manner, for about 20 feet, when she rose and took a position on the top of a log, about two feet off the ground, and here she remained about a minute, twitching her wings and tail, a peculiarity of this species when excited. She flew off and disappeared in some underwood; but on neither occasion did she utter a note that I could hear, but there was no doubt of her

identity as a female mourning warbler, for parting the canes and viewing the nest I found it contained four beautiful fresh eggs; but I inferred that the set was complete and incubation begun. The general color of these eggs was white, with a rosy blush, but less dotted with reddish brown spots than have been other sets of the eggs of this species previously observed.

Since the early years of our family settlement in the township of Peel, I had been acquainted with the appearance of this species, and acquired some knowledge of its life-habits, for it was almost the only member of its family that made its summer home amid the thick brush-wood, and partly cleared spaces along the banks of the little meandering stream that intersected the homestead farm where I passed my boyhood years, and in those early days of our pioneer life in the Canadian back-woods, it was known to me as "the linnet" for some of the elder members of our family stated that it resembled a little bird called by that name in our native land, and during those early times I often saw its nesting places, but of these I have know only dim recollections. During my nine years residence in North Wallace I failed to identify this species among the avifauna of that section; though I noted several other members of this family that to me were previously unknown. After coming to Listowel in the spring of 1874, and devoting more time and attention to the life-histories of our birds, I soon again recognized my old friend of by-gone years, but for a time I confounded it with another species. In this vicinity I found the mourning warbler to be a tolerably common summer resident, but its presence is usually confined to the margins of certain low-land woods; and one June-time day when investigating the avifaunian life of a certain tract of forest, to the southwards of the town, our dog flushed a female of this species, which from her notes and excited actions, I inferred had a nest near by; but which at the time I failed to find. Returning some hours afterwards the bird was again flushed, and after a little search, the nest containing five eggs, was found. This was placed in the butt end of a cedar tree that had been uprooted, but from which the earth had fallen away, the site being about eighteen inches above the ground; this nest was a bulky affair, and loosely put together; being composed of dry leaves, weed stems, vines, rootlets and lined with

hair. This was the first nest of this bird that I discovered of whose identity I was certain. Since then a number of the nests of this species has come under my observations, but nearly all of these were placed among growing vines, and mostly raised off the ground, like the one first described. One however, was placed in a clump of sedge grass, growing in low ground that earlier in the season had been covered with water.

In the "Biological Review of Ontario," published by the Canadian Institute in Toronto, 1891, is an article from me on a nest of the mourning warbler taken that season, which I here reproduce.

"On the 28th of May, as I was doing some work on the margin of a swampy burn, and the highland wood on our farm, I discovered in a clump of yellow-topped weeds a newly made nest, of whose ownership I was at first uncertain, as it seemed to be rather large for any of the warblers that nested in such situations. On the 3rd of June this nest contained four eggs, and as the day had passed without one being deposited, I concluded that the set was complete, so I took them, and they are now in my collection. On this occasion the mother bird was seated on the nest which she did not leave until I almost touched her with my hand, and then, instead of flying out, she ran mouse-like into a neighboring brush-pile, which I shook before she flushed to a stand a few yards off, when she uttered some notes and I had no doubt of her identity as a female mourning warbler. The ground color of these eggs is white, and the spotting more of a brownish hue, than either reddish, or black, and one of the set has its marking on the smaller end. The nest itself was rather bulky for the size of the bird. Underneath on the earth was a platform of dry weed stalks; then dry leaves, which had evidently been put together in a moist condition, formed the bottom and the sides of the nest; but the upper rim, and the inside was formed of fibers of vines and grasses, and there was some cattle-tail hair intermingled with the lining."

In 1871, Dr. A. M. Ross of Toronto, published a little work on "The Birds of Canada," which is remarkable as being the first treatise on this subject composed by a resident of Ontario. The following is what he wrote on the mourning warbler. "Its note is a little 'chit,' uttered in a soft, pensive tone; general color, ashy

gray above, and black underneath. Breeds in Canada, nest in a low bush; eggs four, bluish white."

In length, this species is between five and six inches. The plumage varies somewhat according to age, and season; but is generally on the upper parts of the body of a bright olive hue, with ashy on the head, below clear yellow, the throat and breast being black, the plumage of both sex is similar.

Listowel, Ontario, Canada.

ORNITHOLOGY.

A WHITE PELICAN AT MANOTICK.

J. F. WHITEAVES.

The Museum of the Geological Survey has recently acquired a fine specimen of the American white pelican, *Pelecanus erythrorhynchus*, which was shot two miles south of Manotick, Ont., by Mr. John Flann, Jr., on the 25th of May last. When shot, it was on a log in the Rideau River. It is a fine adult female in full spring plumage, with the culmen or ridge of the upper mandible of its bill flattened, and entirely devoid of the high, thin, upright comb or crest that is so characteristic of the middle of that part of the bill of the male of this species during the breeding season. The bill was partly pale horn and partly pale flesh coloured, with an orange tip to the upper mandible and a yellow patch round each eye; the pouch was bright yellow, the iris of each eye hazel or dark brown (not white), and the legs and feet bright orange. On dissection, the flesh was found to be inflated everywhere by numerous large air cells, most of the eggs were no larger than a small shot, though a few were as large as peas, and the stomach contained six freshly caught yellow perch about three or four inches in length.

The American white pelican, which was first described by Gmelin in 1788, is an abundant summer resident in the prairie country of Manitoba and the North West Territories, where it breeds in colonies, but it is rare in British Columbia. In winter it is common in Florida, and its course of migration northward is said to be along the great inland rivers, for in summer it is es-

entially an inland dweller. Macoun says that stragglers of this species are occasionally taken on Lake Ontario and others on Lake Erie, and Chamberlain that "one specimen has been taken in Nova Scotia and two in New Brunswick." But, so far as the writer is aware, this is the first record of its occurrence in the Ottawa valley. It was previously represented in the Survey collection by one specimen from Lake Winnipeg, shot by Mr. J. M. Macoun in 1884 and another from Crane Lake, Assa., shot by Mr. Sreadborough in 1896; by a series of its eggs, from a small island at the western end of Lake Winnipegosis, collected by Mr. J. B. Tyrrell in 1889; and by a large photograph of the nesting place of a colony, at Shoal Lake, Manitoba.

Two other species or varieties of pelican are of much rarer occurrence in Canada, and both of these are of an essentially marine habit.

One of these is the brown pelican, *Pelecanus fuscus*, which was first described by Linnæus in 1766, and which is common in the Southern Atlantic and Gulf States. During the last ten years at least three specimens of it have been shot in Nova Scotia, and one of these is in the Museum of the Survey.

The other is the Californian brown pelican, *Pelecanus Californicus*, two specimens of which, according to Mr. Fannin, have been shot on the coast of British Columbia. It was first described by Ridgway in 1884, and may be only a local variety of *Pelecanus fuscus*.

The "Pelican of the Wilderness," (Kâath) of the Psalms, is the European white pelican, *Pelecanus onocrotalus*, the male of which has no crest to the upper mandible in the breeding season. This species spends the winter in Palestine and migrates to Russia in the summer. Under the Mosaic dispensation, the use of its flesh for food was forbidden to the Jews. A recent writer says of it that the operation of feeding its young is rendered easier by the parent pressing the pouch and lower mandible against the breast, and the contrast of the red hook of the bill with the white of the breast probably gave rise to the poetic idea of the ancients, that the female pelican nourished her young with her blood. From the earliest times the pelican has been the emblem of charity.

MY BIRDS AND HOW THEY CAME TO ME.

It was my good fortune to spend the coldest week of this winter in a small New Hampshire town on the bank of the Connecticut River. The thermometer stood at 25° at breakfast time; the days were sunny, the air was still, and the moon at the full; all this with an unbroken level of fresh snow made winter a delight to one "who likes that kind of thing."

Sparrows were not to be seen at our end of the town, but chickadees, white-breasted nuthatches, pine grosbeaks and downy and hairy woodpeckers were more or less common visitors. A sheltered corner of the verandah had been wired in below by way of protection from cats and in this corner was a large wooden trough filled with dried sun-flowers, while suet hung from the trees and shrubs near by. To the sun-flowers came flocks of chickadees, with an occasional nuthatch, in and out the live-long day. I watched them with delight and came home to try my hand at feeding birds in Cambridge.

On the south side of the house stands a willow-tree whose long boughs reach out in all directions, making in summer a forest of green, where birds of various kinds find camping ground. There have been crows, robins, grackles, rose-breasted grosbeaks, pine grosbeaks, white-breasted nuthatches, chickadees, brown creepers, flickers, downy woodpeckers, humming birds, song sparrows, chipping sparrows, redstarts, cedar birds, vireos, summer yellowbirds, orioles, blue jays, golden-crowned kinglets, goldfinches, cuckoos, and once—A day to be remembered!—one of the maids came breathless to my door.

"Please, Miss, John wants you to look out of the window to see a bird."

"What is it, John?" I said.

"Well, it was the reddest bird I ever seen. I was watering the purple beech and he came and bathed in the pool; but now he's gone."

"Don't you think it was a robin?" I asked in exact imitation of my own Bird-man, who generally calls all my new birds English sparrows.

"Robin?" repeated John, "Well, no, it wasn't a robin. As if

I didn't know a robin!" muttered the exasperated observer ; and sure enough, as I stood at the window, still thinking, "it was just a robin," suddenly there lighted on the willow bough almost within touch, "the reddest bird I ever seen."

"Do I look like a robin?" he asked.

"No, not in the least," I answered. "You beautiful scarlet tanager!"

All these birds have at various times perched on the willow-tree, but until this year I had never thought to feed as well as shelter the winter guests.

The first venture was in suet ; cutting pieces as large as my fist and tying them to a long string I threw them from my bedroom window over the nearest willow bough fastening the string to the window-sill so that the suet was quite under control. At the end of a week the chickadees were literally in full swing.

I next bought a peck of sun-flower seeds and scattering them on a drawing-board I put the board on the window-ledge shutting down the sash to steady the board. In three days the chickadees were on the board. I then bought a plaster-cast of a hand and arm, filled the hand with seeds and put it on the window-ledge. The birds came to the hand. Finally I put out my own hand with seeds and in two minutes a chickadee was on my hand. No one who has not tried it can know the pleasure of feeling the little feet of a wild bird clinging to one's finger. Since then the chickadees have come to me every day, even flying about the room,—this, however, is accidental and not always agreeable to them ; one however made himself quite at home, flew from one spot to another without dismay, and at last perched on the top of the door, and when I reached up my hand he hopped upon my finger and let me carry him to the window. A basket full of sun-flower seeds and chopped raw peanuts stands on the window-ledge and to this come the nuthatches as well as the chickadees ; but they are not so tame and although one comes to me and flutters over my hand, its courage fails it at the last and it darts back to the willow bough and cries "yank, yank," until I draw back my hand, and then it flies to the basket and looks up in my face quite at its ease. A woodpecker has been at the basket ; the kinglets poise under the suet, and once I saw a goldfinch hanging on it.

In February we had a small flock of pine grosbeaks feeding on the privet berries and on rotten apples thrown on the ground, a flicker also came every day for the apples. In trying to hang an apple on the willow bough for the grosbeak I miscalculated the length of the string, the apple fell short, rebounded and broke the dining-room window. The glass was mended, I tried again, and an apple hung oddly enough from a winter-bare willow bough, and I sat me down to wait for a grosbeak. In a few minutes a great gray squirrel ran up the tree and in clawing the apple he tipped it over the bough and it hit the window again; this time, however, without any castastrophe. Probably a squirrel cannot throw as hard as a woman. After that the apples lay on the ground, or rather on the snow, for until quite lately there has been no "ground" to be seen.

Now that the snow has almost gone and the birds are finding food elsewhere, they come less often to my window, but the pleasure of having had them will be a joy forever.

M. E.

Cambridge, Massachusetts,

March 22, 1904.

SUB-EXCURSION TO BLUEBERRY POINT.

The Ottawa Field Naturalists' Club held its second sub-excursion for 1904 to Blueberry Point, Aylmer, on May 7th. About 150 persons were present, the Normal School and the Ottawa Latities' College being well represented.

The Trailing Arbutus (*Epigaea repens*) was very abundant and eagerly collected. The banksian, red and white pines were observed and *Viola cardaminefolia* and *V. subviscosa*, collected in good condition.

At the close of the afternoon's work Dr. Sinclair assembled the party and called for addresses from the leaders present. Mr. W. J. Wilson illustrated by means of a map the geographical formation of the district, and gave some valuable hints to those commencing field work in geology. He pointed out that the unusually high water of the Ottawa River had covered all the shore

material and prevented his section from doing any work in the usual locality. Messrs. Gibson and Young reported the season a backward one, as they had taken very few species of insects. Two species of butterflies, the Spring Blue and the Early Native White were observed for the first time this year.

Rev. Dr. Blackader and Mr. Clarke spoke of the plants found. Dr. Macdonald, M.A., drew attention to the benefits to be derived from an outing with the Field Naturalists' Club, and expressed his appreciation of their work.

BOTANICAL NOTES.

ALUM ROOT AS A REMEDY FOR DIARRHŒA.

An interesting note on the medicinal value of Alum-root, (*Heuchera hispida*, Pursh) has been sent in by Mr. W. McCarthy of Rat Portage, Ont., who writes : "I was out prospecting with two white men (Mr. Moore and Mr. Walters) and an Indian. The two former were taken sick with severe diarrhœa for three days. The Indian left camp and went to the bush and got some of the plant I send you. He gave each of the men about an inch of the root to chew and swallow the juice. It acted like magic and the next day they were quite recovered. I have since had some of the root pounded fine and put a little water on it and boiled it up with sugar. I then strained it and have given it to several infants for cholera infantum and it has proved successful. The plant is abundant here and I have given it to several who have also used it successfully." The closely allied *Heuchera Americana*, L.,^o is known to be a powerful astringent.

J. FLETCHER.

NATURE STUDY—NO. XIV.

SOME UNDERLYING PRINCIPLES, METHOD AND SYSTEM OF NATURE STUDY.

C. W. G. EIFRIG.

Most educators, and people of alert mind generally, have come to recognize the usefulness and even necessity of Nature Study for people in general and the young in particular. I hold that to study and know something about nature and the objects in it, among which we live, which we see, hear and are brought in more or less close proximity to, is as useful and profitable for a person as some of the branches of science and art hitherto taught in schools and colleges to the exclusion of everything else. For instance, if we learn at school, where a certain city or river is situated in the world, which we shall perhaps never see or even hear of again, it is just as valuable to know where certain trees and plants grow, especially in our neighborhood, and why, and where the different individuals or families of living things stay and where they do not as well as for what purpose. If we read in history of the irruptions of, say, the Huns into Europe and their defeat A.D. 453, or of the immigration of the Anglo-Saxons into Britain 449 A.D., etc., it is just as important and valuable for people to know about the irruption and migration, the appearance and disappearance of insects, birds, mammals, fishes, plants, etc., which may affect our lives favorably or unfavorably, destroy our crops or trees, or help us to overcome such pests, etc. If we derive endless pleasure by studying the gems of thought and diction in literature, why overlook the gems of God's own handiwork in His mineral, vegetable and animal kingdoms surrounding us! And these can be found and enjoyed not from dusty books, but out in the sweet-scented air and healthgiving sunshine. If a person not used to it, once tries to see and observe things in nature, he will soon find how little he is able to see and hear and differentiate correctly, how little he can use his senses properly, showing that while his head may be crammed full of book knowledge, his faculties to rightly observe things near him have been neglected, and he will perceive, that, though he knows a good deal about things far removed from him by space or time, he knows little or nothing

of things surrounding him, of which he perhaps makes daily use or could do so, and from which he might be able to derive enjoyment if he were able to understand, know or at least properly observe them. So, there can be no difference of opinion as to the usefulness and necessity of Nature Study. But, regarding the ways and means of it, there is as yet no concurrence of opinion. And it is the object of this paper to state some underlying principles for Nature Study as the writer conceives it, whether it is carried on professionally or in an amateur-like manner, and whether much or little time can be devoted to it.

In the first place, Nature Study must not be looked upon and taken up as a *fad*. Ours is eminently an age of fads. Faddism is carried into every branch of human activity. If one takes up Nature Study, or any other study, as a fad, as a passing whim of fashion, as an affectation of some people, he or she thereby debases such study, debauches the mind and intellect, and squanders time and money. No, it must be looked upon as a study requiring earnestness of purpose, all powers of mind and body while carried on, devotion and application to it, also patience and resourcefulness. Whoever does not want to undertake Nature Study in this way, had better not begin it at all, or at least not call his weak dabbling with science and nature or his more or less purposeless rambles, Nature Study.

As is necessary in most undertakings of men, a student of nature must not begin his work at random, in a purposeless and ever-shifting way, but there must be method and system in his work, be this much or little. To attempt to carry on Nature Study without this would be as foolish as trying to build a house without plan or fixed idea. As a few most necessary principles underlying the system and method of the study of nature, I would submit these, viz.: *Limitation, concentration, exactness*, and after all this, the making *accessible* to others of the results.

So, first, there is *limitation*, i. e. that a student of nature, professional or otherwise, confines himself to certain limited areas of investigation of objects offered us by nature. Life is too short, even for one who can give *all* his time to this, to take up all the fascinating problems that ask for solution in the realm of nature. So, if a lover of this study would plunge himself into it headlong,

try to begin everything, and follow all lines of investigation, he would soon be hopelessly stranded and become disgusted at the impossibility of his undertaking. One should rather take up a small area, the smaller the less his time is, and he may obtain gratifying results. If you cannot take up botany entire, or dendrology, or herpetology or ichtyology, etc., take up a small item in one or more of these, *e. g.* the study of mosses or lichens or mushrooms, or begin with a family of trees or birds or fishes or insects. There are few, even among the most common insects or birds or mammals, whose life history is entirely and completely known.

Furthermore there is *concentration*, in which must be included thoroughness and patience. One must concentrate his mind on the chosen study, and give it his best efforts. He must not be superficial but thorough in his observations. He must not jump at conclusions. That is extremely dangerous. Science does not want it, although many scientific men indulge in it. Science is derived from the Latin *scio*, to know; it must deal with *facts* only. So, painstaking, laborious investigation and observation is wanted, not half-observed phenomena and guesses. Sometimes an infinite amount of patience is required. Think of John Burroughs digging away two or three tons of earth in order to understand the ways of a weasel's underground home! Or Audubon, now in the far west, now in Labrador, now in the limitless forests of Kentucky or the impenetrable mangrove thickets of the gulf coast, in heat and cold, observing, sketching, recording. If a bird or insect with which one wishes to become acquainted flies into a thicket or swamp, it will not do to remain outside; it means to follow it up at the risk of ruffling one's clothes and temper.

Coupled with thoroughness must be *exactness*. A student may be thorough, not spare himself labor and exertion, and yet not be exact in getting at his results or recording them. If he sees a certain damage done to a plant by insects, and finds an insect on the plant, it would not do to assume that this is the author of the harm until he sees it at work. The same holds good in all other branches. One must have a sense of responsibility, feeling that by inexactness he may cause people to believe and circulate untruth, which would always be harmful, leaving aside the moral issue.

And last but not least, a conscientious, patient, systematic student of nature should consider it his duty to *make the results of his labors accessible* to others, to science in general. If a per-

son has found out one fact concerning any mineral, plant or animal, large or small, a fact not known before or disputed, and is certain of it, he contributes to the sum of human knowledge by having it printed in some suitable medium of communication between scientific men, or where they can find it. At least let him give his notes to some such person who is able to apply the fruit of his labors to wider usefulness.

Now, after reading this, some ardent lover of nature who thought of becoming an amateur student of it, may say to himself, well, this rules me out of Nature Study; I have neither the time, nor the money, nor the scientific attainments of the mind to carry it on in this wise. But hold on! The underlying principles here mentioned, namely limitation, concentration, exactness and the making the results of your observations accessible to others, does not necessarily require all one's time, or much money and great scientific knowledge. There are people who have contributed largely to the sum of human knowledge who were busy men and did not have much leisure time and remained in their occupation throughout their life, one, a fellow of the Linnaean Society, London, remaining a cobbler to the end of his days. Nor must you think that only startling discoveries are valuable to man. No, many little, but correct observations round out the sum total of human knowledge just as surely and effectually. And how many great discoveries etc., have been begun in a small way! Look at James Watt, pondering over the phenomenon of the escaping steam from the tea-kettle lifting up the lid. By following this up, he became the inventor of the steam engine. The lawn in front of your house may harbor an insect new to science. Novices in astronomy have discovered new stars. Tenacity of will-power counts for most here, whether one has little or much time. And even if you can not achieve any results satisfactory to yourself, you will at least get into closer touch with nature, your powers of the senses will be whetted, you will see and hear more beautiful things than people who have no eye or ear for them, though they live right amongst them. It is a thing of beauty and a joy forever to observe the ways of living things in field, woods and meadow; to see the wise adaptation of means to certain ends and to behold the beauty of design and finish in even the minutest specimens of God's handiwork in nature. And then, there is the healthfulness of it! Pure air and sunshine are by far the best preventive and curative medicines in the world. And while taking them in, it is better to have some object in view, to engage the mind somewhat, else it will soon become tedious. And that something ought then to be one of the fields of Nature Study, even though a much restricted one must be chosen.

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CONTENTS.

	PAGE
1. On the Squamoso Parietal Crest of Two Species of Horned Dinosaurs from the Cretaceous of Alberta, by Lawrence M. Lamb	81
2. The Mountain Bluebird in Manitoba, by Norman Criddle	85
3. Note on the Food Value of Certain Mushrooms, by Frank T. Shutt	87
4. General Excursions	89
5. Conchological Notes	91
6. Nature Study—No. 15.. . . .	93

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No. 4

ON THE SQUAMOSO PARIETAL CREST OF TWO SPECIES OF HORNED DINOSAURS FROM THE CRETACEOUS OF ALBERTA.

By LAWRENCE M. LAMBE, F.G.S., F.R.S.C., (With two plates.)

One of the most interesting features of the fauna of the Belly River series of the Cretaceous of the West is the presence of Cera-topsids more primitive than those of the Laramie. Of the former the writer, in the second part of volume III (quarto) of Contributions to Canadian Palæontology, 1892, described three species of *Monoclonius*, viz. *M. dawsoni*, *M. canadensis* and *M. belli*, all from the Red Deer river district. In a further study of the type material on which *M. dawsoni* was founded, it became apparent that two species had been included under one name and also that the species distinct from *M. dawsoni* probably represents a new generic form. The material denoting the new genus and species, and originally referred to *M. dawsoni*, consists of a large posterior crest (p. 59, fig. 15, op. cit.), with which was found a nasal horn core. This crest is unique in having hooked-processes developed on the posterior border.

For the form represented by the crest with hooked-processes the generic term *Centrosaurus* is proposed and the name *apertus*, in reference to the large fontanelles, is deemed an appropriate one for the species.

In a paper by the writer, to be published shortly, a detailed description with figures will be given of the posterior crest of *Centrosaurus apertus* as well as of that of *Monoclonius canadensis*. The skull, described in the above mentioned memoir, p. 57, fig. 14, cat. No. 1173, is retained as the type of *Monoclonius dawsoni*.

The fontanelles of the crest of *Centrosaurus apertus* are included entirely within the parietal part of the expansion, those of *Monoclonius canadensis* are bounded on the outer side by both the parietal and the squamosal.

The crest of *C. apertus* is composed principally of the coalesced parietals which form an expansion having somewhat the shape of a saddle, broader than long and much more robust posteriorly than in front where the bone is decidedly thin. The squamosal is not known. The parietal part of the expansion, figures 1 and 2, plate I, is longitudinally ridged in the median line, is broadly expanded laterally on either side, and ends posteriorly in a robust transverse bar that is concave in outline behind as viewed from above. The fontanelles occur one on either side of the median line and are of large size: they are bounded behind by the transverse bar that forms the posterior border of the crest, and laterally and in front by the thin side extensions. Along the median line the bone is transversely concave beneath. The separate ossifications, named by Marsh epoccipitals, are well developed in four pairs, with in addition the pair of hooked-processes, already mentioned, which are regarded as specially developed epoccipitals. The alar extensions are referred to in the original description as the squamosal portion of the crest, the squamosals being then regarded as having coalesced with the parietals. Near the anterior border of the right extension, however, there is a definite line of demarcation, *a*, figures 1 and 2, which can be considered only as the suture for the squamosal. The writer's attention was drawn to this suture, and to the wrong interpretation in the original description of the nature of the side extensions, by Mr. J. B. Hatcher, Curator of the Department of Vertebrate Palæontology of the Carnegie Museum, Pittsburgh, who, with his intimate knowledge of the *Ceratopsidæ*, is justly regarded as one of the foremost authorities on this interesting family. The postfrontal suture, *b*, figures 1 and 2, extends from the inner side of the anterior end of the fontanelle obliquely forward and inward to the median line in front. Numerous impressions of blood-vessels are present on and in the neighbourhood of the epoccipitals and hooked-processes, and on the upper surface along the median ridge. The thickness of the bone at a number of points, is indicated in centimetres by the numerals in figure 1.

The horn core, figure 3, found with the crest is presumably a nasal one. It is straight, and laterally compressed so as to be lenticular in cross section presenting a sharp edge to the front and rear. A somewhat similarly shaped nasal horn core has been described by Cope under the name *Monoclonius sphenocerus*. One side, that figured, is deeply channelled longitudinally, the other is more regularly convex; vascular markings are conspicuous on both sides. There is apparently no great distortion, if any, of the specimen, which is 30 centimetres long and imperfect at the tip and below.

We may conclude from the above that *Centrosaurus apertus* had a broadly expanded squamoso-parietal crest composed mainly of the coalesced parietals, the squamosals being confined to the antero-lateral edge of, and taking but little part in the formation of, the frill. That the large oval fontanelles were included entirely within the parietal part of the expansion and that epoccipital bones were well developed, of which the hinder pair were greatly modified so as to form large hooks or spurs of bone on the hinder border. That a closely fitting integument was present, as is indicated by the many impressions of blood-vessels on the upper surface, with the probability that the projections of the periphery at the sides and behind were sheathed in horn.

The squamoso-parietal frill of *Monoclonius canadensis* is represented by a well preserved right squamosal, figures 4 and 6, and part of the parietal, figures 5 and 7. With these were found other parts of the skull, to which reference has been made in the original description.

The squamosal is plate-like, somewhat triangular in shape, with the apex of the triangle directed backward. The inner border is concave in outline, the outer one convex and scalloped. The front border has two deep emarginations in its outer half; in the inner half are the sutures for the jugal and postfrontal. Its upper surface is smooth. Beneath is a deep pit, *c*, figure 6, which received a process from the quadrate, and at a slightly lower level the outer end of the exoccipital probably effected a junction where the broken surface is indicated at *d*. A shallow groove, *f*, figures 6 and 4, extends from the raised surface for the exoccipital to and over the inner border to the upper surface where it ends; it becomes deeper and narrower near the border. There is a wide triangular excavation in the inner front portion of the lower surface with indications that the bone here overlapped the postfrontal to some extent, the contact with the jugal being limited to a small surface which would include the marginal pit shewn in figure 4 at *e*.

The parietal reached the squamosal from behind by means of an attenuated lateral extension of which only the anterior extre-

mity is known. This part of the parietal is keeled below, figure 7, and is triangular in cross section, with a flat upper surface, figure 5, that fits into a shallow groove along the inner posterior border of the lower surface of the squamosal as shewn by the dotted lines in figures 4 and 6. Its free outer border behind continues the sinuous curves of the outer border of the squamosal. The parietal portion of the crest of this species may have had some resemblance to the coalesced parietal bone, the only known part of the crest, of *Monoclonius belli*.

On the inner side of the squamosal and the forwardly directed posterior extension of the parietal was an opening in the crest of great size much larger probably than the parietal fontanelle of *Centrosaurus apertus*.

From the foregoing it is seen that the posterior crest of *Monoclonius canadensis* extended far back, that it was made up of the parietals (probably coalesced and bearing some resemblance in form to the corresponding portion of the frill of *M. belli*) and the squamosals, the latter entering largely into its composition, and that fontanelles of very large size were present. We find also that the fontanelles were not included entirely within the parietals, as in *Centrosaurus apertus* but were bounded laterally in front by the squamosals.

EXPLANATION OF PLATES.

PLATE I.

- Figure 1—Coalesced parietals of *Centrosaurus apertus* viewed from above; one-eighth natural size.
Figure 2—The same, viewed from the right side and similarly reduced.
Figure 3—Lateral aspect of nasal horn core of *C. apertus*; one-eighth natural size.

PLATE II.

- Figure 4—Right squamosal of *Monoclonius canadensis*, exterior view; one-sixth natural size.
Figure 5—Upper surface of front end of right lateral posterior extension of parietal of *M. canadensis*; similarly reduced.
Figure 6—Interior view of the squamosal shewn in figure 3; similarly reduced. The dotted line in this figure and in figure 4 indicates the position of the parietal extension when applied to the squamosal.
Figure 7—Lower surface of the bone shewn in figure 5; similarly reduced.

THE MOUNTAIN BLUEBIRD IN MANITOBA.

By NORMAN CRIDDLE, of Aweme, Man.

In an interesting paper on "Rare Manitoba birds," read before the Historical and Scientific Society of Manitoba, on February 9th, 1904, by Mr. G. E. Atkinson and published in the Manitoba Free Press, mention is made of two Mountain Bluebirds (*Sialia arctica*) having been seen in October, 1896, near Brandon, one of which was shot. These are apparently the only records of the bird's appearance in Manitoba, excepting a few notes on their migration sent by me to the United States Biological Survey.

This bird is, however, by no means uncommon in the tract of country lying between this place and Carberry—known locally as the "Sand Hills" or "Spruce Bush"—and it seems probable that, when its favourite haunts are more generally known, it will be found in several of the more hilly parts of the province.

The "Sand Hills" mentioned above consist of low sandy hills, very often with blow-outs on their south sides and underbrush on the north. These hills, which seldom rise more than forty feet above their bases, usually contain on their tops and sides—when protected from fire—clumps of spruce, and between their ranges—that contain an occasional pond—grow aspen, willows and a few stunted oaks, etc.

These oaks which are often hollow, in company with a few old stumps that have been previously used by woodpeckers, make ideal nesting places for the bluebirds, and any person in search of them during the latter half of June, would probably find several nests in a day.

Of the numerous nests examined by me, some were more than nine feet from the ground, the average being just under four. They were built of dead grass and contained, when the birds had finished laying, six eggs, which closely resemble those of *S. sialis*, excepting that they are smaller.

The reason that these birds are not more generally known in Manitoba, seems to be their habit of seldom flying far from their breeding ground. As an instance, I have lived within five miles

of their nesting places for over twenty years without seeing one here.

My migration notes are unsatisfactory. The earliest arrival was noted May 7th, 1900, the last noted being October 14th, 1899, and October 16th, 1900. These dates could probably be extended both ways, as they are taken after only a few hours spent in the "Sand Hills" with long intervals between each visit.

For the benefit of readers that are not acquainted with the different bluebirds of North America, the following distinguishing features of our Canadian species may prove of interest:

BLUEBIRD (*S. sialis*). Male: above azure blue; throat and breast rusty brown; belly whitish. Female: blue of back more grayish brown; breast less rusty. Male in winter much the same as female.

WESTERN BLUEBIRD (*S. mexicana occidentalis*). Male distinguished from *S. sialis* by having rusty brown on fore back and the throat blue. Female duller. The range of this species is given in Chapman's Colour Key, as "Pacific coast from Northern Lower California north to British Columbia," etc.

MOUNTAIN BLUEBIRD, (*S. arctica*). Male: above bright blue; throat and breast rather paler; belly whitish. Female: above bluish gray, with very slight brownish tint; rump blue; throat and breast bluish buff; belly white. The specimens observed closely by me seem to be distinctly bluer than the description in Chapman's Colour Key. This species is said to breed from "Sierra Nevada east to the plains, and from New Mexico north to the great Slave Lake region."

There is practically no difference in the length of these three birds.

NOTE ON THE FOOD VALUE OF CERTAIN MUSHROOMS

By FRANK T. SHUTT.

In the minds of most of us, no doubt, mushrooms are regarded rather as a delicacy than as an article of food. Their peculiarly agreeable and somewhat piquant flavour when properly prepared and carefully cooked has established for many species of edible fungi a world-wide reputation for the making of ragouts, sauces, and as "flavourers" generally; but, speaking broadly, most have failed to recognise their highly nutritious character. Their price in city markets is undoubtedly out of all proportion to their value as food, but we must conclude that the well-nigh general neglect to gather and use them in districts where they occur in abundance, is due chiefly to ignorance of their nature from the standpoint we are now considering them.*

Analysis shows them to be characterized by a comparatively speaking large percentage of nitrogenous matter (crude protein), a considerable proportion of which exists in the form of true protein or albuminoids. The function of this latter class of constituents of foods is to repair the daily waste of the body and build up its tissues, and hence the proteids are commonly known as flesh-formers, and are consequently to be regarded as the most important of the nutrients, whether in animal or vegetable foods.

Last autumn, in order to obtain data that might be of interest in this connection, a partial analysis was made of certain species that are found in abundance on the lawn of the Experimental Farm, Ottawa. These comprised the Fairy-ring Champignon (*Marasmius oreades*), the Grey Coprinus or true Inkcap (*Coprinus atramentarius*), and the Shaggy Coprinus or Horse tail Mushroom (*Coprinus comatus*), commonly known as "Umbrellas". The results are as follows:—

*There are, we know, many persons who have a dread of all fungi, for fear of being poisoned, and it is only natural that they should hesitate to avail themselves of these nutritious delicacies.

Collected Oct. 14th., 1903.	Dry Matter. per cent.	Crude Protein. per cent.
1. <i>Marasmius oreades</i> , mature ...	10.15	4.67
2. <i>Coprinus atramentarius</i>	5.67	1.37
3. " <i>comatus</i> , immature...	9.10	2.97
4. " " mature...	6.77	2.71
5. " " old, but firm	6.14	1.36

In the case of the *Marasmius*, it was found that 70 per cent. of the crude protein was present as albuminoids. Of the crude protein in mature *C. comatus* (No. 4), 68 per cent. existed as albuminoids, a percentage that was reduced to 48 in the older specimens of the same species (No. 5). Unfortunately, by reason of insufficient material, the proportion of albuminoids in the crude protein of Nos. 2 and 3 could not be determined.

When it is pointed out that but few of our commonly used vegetables and salad plants contain more than 10 per cent. to 11 per cent. dry matter—and many of them, as vegetable marrow, celery, lettuce, cucumbers, &c., do not possess much more than half such an amount—it will be obvious that mushrooms are worthy to rank with these most useful articles of diet. But it is not merely in dry matter that the edible fungi make their claim to recognition as a food. This dry matter is highly nitrogenous. Our data on this point are very clear. Further, these analyses indicate that the greater part of this nitrogenous matter exists in the more valuable form of albuminoids. In this respect, mushrooms are without doubt much superior to vegetables and fruits.

If time permits, this work will be continued during the coming season. There are many other species of edible fungi in abundance, in addition to those mentioned in this note, and we hope, as opportunity offers, to ascertain their relative food values. We, further, wish to examine these mushrooms at various stages of growth, for the results from the *C. comatus* here given would indicate a falling off in nutritive value after reaching a certain degree of edible maturity, due to decreasing dry matter and albuminoids. This may only occur in the deliquescent fungi, but it will be interesting to have further data upon what must be considered a point of both scientific and economic importance.

Laboratory, Experimental Farm, Ottawa, May 1st, 1904.

GENERAL EXCURSIONS.

The Ottawa Field Naturalists' Club held the first general excursion to Casselman on May 21st. The president, Mr. W. T. Macoun, was in charge, and leaders in various branches of the Club's work were present, but the heavy rains of the preceding days limited the attendance to a few members of the Club.

The collecting field at Casselman is a most varied one, and the different sections soon separated for the day's work. Dr. Ami took a party along the bank of the Nation River, and they were successful in unearthing numerous relics of the South Nation Indians, an Algonquin tribe whose name is borne by this tributary of the Ottawa river.

Dr. Fletcher, Messrs. Gibson and Young led the entomological section and secured many specimens of insects, among them 10 different species of butterflies. *Thecla niphon* was, perhaps, the rarest of these. This is a small brown butterfly the caterpillar of which feeds on the young shoots of pine trees. A specimen of the rare beetle *Hylecæus lugubris* was seen on the railway track and was caught but made its escape. Several specimens of *Sphæridium scarabæoides* were secured.

The ornithologists found that both locality and season combined to furnish ideal conditions. No less than forty-nine species of birds were observed by Rev. C. W. Eifrig. The Greater Yellow-legs and the Black-bellied Plover were both seen along the river. A Migrant Shrike's nest with five young and one egg was found. The nest was placed on one of the lower branches of a plum tree. A Bluebird's nest with 5 eggs and a nest of the Savanna Sparrow were also seen.

The botanical section found several species that are not of common occurrence near Ottawa. Four species of *Trillium* were collected, the rarest being *Trillium cernuum*. *Trillium grandiflorum* with exceptionally large flowers was common. In some of these the white petals from the base to the open measured $2\frac{1}{2}$ by $1\frac{1}{2}$ inches wide. Specimens in one clump were semi-donble and had in some instances the sepals petaloio and more or less white. Some violets were in splendid condition. *Viola brauda* was remarkably fine and in such enormous abundance as to scent the

air. *Viola affinis* grew in the crevices of the rocks beside the river. In a creek bottom *V. cucullata* was very beautiful. *V. prionosepala* was also collected at the edge of the woods as well as *V. Dicksoni*. *Corylus Americana* was added to the flora of the district, by Prof. Macoun. Dr. Fletcher found an interesting hybrid between *Osmunda claytoniana* and *Osmunda cinnamomea* growing in a clearing where both of these ferns were very abundant. The strawberry blossoms (*Fragaria Virginiana*) presented a strange appearance in one place; the petals were modified so as to bear anthers at their tips, and could be seen in all stages of transition from petals to anthers. Although spring only began on the 1st of May, this season's growth has been very rapid.

The Ostrich Ferns in the alluvial soil of the river bottom were fully five feet in height, and so dense as to resemble a picture of tropical vegetation. *Phlox divaricata* was found; but the splendid beds of this beautiful flower which formerly occurred on the south bank of the river have been almost destroyed by the forest fires—On the north bank clumps of *Rudbeckia laciniata* were found in one spot. The only land shell of interest was *Helix Sayi*.

The SECOND GENERAL EXCURSION was held on May 28th to Gilmour's Grove, Chelsea. Through the kindness of Messrs. Gilmour and Hughson, the beautiful grove overlooking the grand rapids on the Gatineau River was thrown open to the club, and about 200 members and their friends took the opportunity of again investigating this rich locality. The day was simply perfect for such an outing, and many interesting specimens rewarded the collectors. Mr. Arthur Gibson and Mr. D. A. Campbell captured many insects of interest; among these, *Thecla niphon*, *Amblyscirtes samoset* and *Nisoniades juvenalis* may be mentioned. The botanical treasures as usual were most numerous among the collections. *Cypripedium acaule* was found in small numbers; other orchids exhibited at the end of the day were *Orchis spectabilis* with the whole flower purple, and *Habenaria Hookeri*; *Viola prionosepala* carpeted the woods in one place. A prize offered for competition by Miss Cowan for the largest number of species observed, was won by Miss Constance Anderson. Several ferns were collected, and Miss K. Lee exhibited fine plants of *Woodsia ilvensis*, and *Asplenium Trichomanes*. Dr. Fletcher showed a specimen of *Botrychium matricariaefolium*, of species which had only once before been found in the district, at Casselman, many years ago.

At 5 o'clock the President, Mr. W. T. Macoun, called the meeting to order and the usual addresses were given. Mr. Macoun spoke shortly of the objects of the club and urged the claims of the club for more general support by all interested in Natural History and Nature Study. He spoke also of some of the trees growing in the locality. Dr. Fletcher spoke of some of the plants collected and gave information about specimens handed in.

Mr. D. A. Campbell spoke of and exhibited some of the insects collected during the afternoon and dealt with the habits of tiger beetles, dragon flies and other insects, also with the methods of collecting, killing and preserving insects.

Dr. S. B. Sinclair spoke of the pleasures to be gained from such meetings as the club gave opportunities for, and at his request the party had the pleasure of hearing the ladies and gentlemen of the Normal School present sing "Sweet and Low," which was done with great taste and was much enjoyed by all.

Mr. Congdon, of Malone, N.Y., on invitation of the President, expressed his pleasure at being a participant in the excursion and of the value of Nature Study to which he had given some attention in his professional work as a teacher. T. E. C.

CONCHOLOGICAL NOTES.

MARGARITANA DELTOIDEA.

Some years ago, while looking over a box of "dead" shells collected in the Rideau Canal above Hartwell's Locks, I was surprised to find among them a single specimen of *Margaritana deltoidea*. Although the species might from its known range be expected to be found in the vicinity of Ottawa, I concluded, as I had not observed it previously, that the specimen must have been placed with the canal shells by the busy but unscientific little hands that occasionally find occupation in my cabinets. I was confirmed in this conclusion by the fact that a search, made under favorable conditions in the locality in which the box was collected, was fruitless so far as this particular species was concerned.

Last summer, however, while trout fishing on the South Branch of the Quyon River, near Thorne Centre in the county of Pontiac, I found a living example—and but one—of this interesting little pearl bearer. It may occur in other places near Ottawa, and is, I am now inclined to think, to be found in the Rideau Canal.

In any case it should be added to our list as occurring in the Quyon. In outward appearance it resembles a small specimen of the common brown clam, *Unio complanatus*.—F. R. L.

INTRODUCED MOLLUSCA.

It is well known that the eggs of many species of mollusks, as well as the mollusks themselves, are highly resistant to heat and cold, and that some endure desiccation extending over long periods of time. The eggs are frequently deposited among the roots and stems of grasses and plants. Several species have been widely distributed in the straw used for packing articles shipped from Europe to this country. I have no doubt that *Helix cantiana*, which abounds at Quebec in restricted localities near the Citadel and the Observatory, originated in the packing material thrown over the walls of the fortress and on the declivity above the Cove Fields. Two notable importations were brought to my notice some time ago. One was the large European slug, *Limax maximus*, L., which was found by Mr. Scrim in one of his conservatories at Ottawa. The animal had an extent of over four inches, and would in large numbers be very destructive. Fortunately it occurs but rarely and is easily seen. But the other, *Zonites alliarius*, is a much more serious pest. It is minute in size and occurs in considerable numbers. Mr. Scrim finds it chiefly in the greenhouse devoted to the cultivation of palms, ferns and selaginellas. The lace-like traceries wrought on the under surface of a leaf betray the presence of the tiny operator and result in his destruction. When crushed by the horny-handed toilers in the greenhouse, the animal gives forth with its dying breath a strong and surprisingly permanent odor of garlic. Hence the specific name—*alliarius*, L.—F. R. L.

I have received from Mr. G. A. Knight, of Mount Tolmie Nurseries, Victoria, B.C., specimens of this European Mollusk which he has found in some numbers in his greenhouses.—J. F.

NATURE STUDY—No. XV.

HOW TO COLLECT AND PRESERVE PLANTS.

By W. T. MACOUN, Horticulturist, Central Experimental Farm, Ottawa, Ont.

While Nature Study does not necessarily involve the accumulation of natural history specimens for the purpose of forming a herbarium; a collection of insects or of bird skins, the making of a collection is undoubtedly of great value both as a means of bringing the student into closer contact and more intimate acquaintance with natural objects, and of inducing a continued and well directed study of them. If one decides to make a collection, it is of the greatest importance that he begin in the right way. It frequently happens that young people, and adults as well, in their enthusiasm, begin collections; but, through ignorance of the best methods of collecting and preserving their specimens, these are improperly made, or, through not knowing the way to preserve them, are soon destroyed by insects, and the collector's enthusiasm is dampened. It is then difficult to get him to start again.

It was felt by the Council of the Ottawa Field Naturalists' Club that very useful work would be accomplished by giving a demonstration of the best methods of collecting and preserving natural history specimens so that anyone who wished to begin a collection might do so in the right way. Accordingly, a special meeting of the Club was held on April 26th, 1904, and demonstrations were given by experts in various branches of science. Mr. A. G. Kingston described his methods of observing and identifying birds with a field glass. Dr. Jas. Fletcher spoke on the advantages of the study of Entomology. Dr. H. M. Ami discussed the collecting and preserving of geological specimens. Demonstrations were given of the mounting of plants by Miss Macoun; of insects, by Mr. A. Gibson and Mr. W. Metcalfe; inflating caterpillars, by Mr. C. H. Young; preparing geological specimens, Mr. Geo. Burland.

In addition to the addresses and demonstrations already referred to, Prof. J. Macoun told how to collect, mount, and preserve botanical specimens, and, in order that as many as possible may get the information thus given by him, the most important

points with regard to collecting and preserving, are made the subject of this Nature Study article, and it is hoped that the other addresses which were given will be published also.

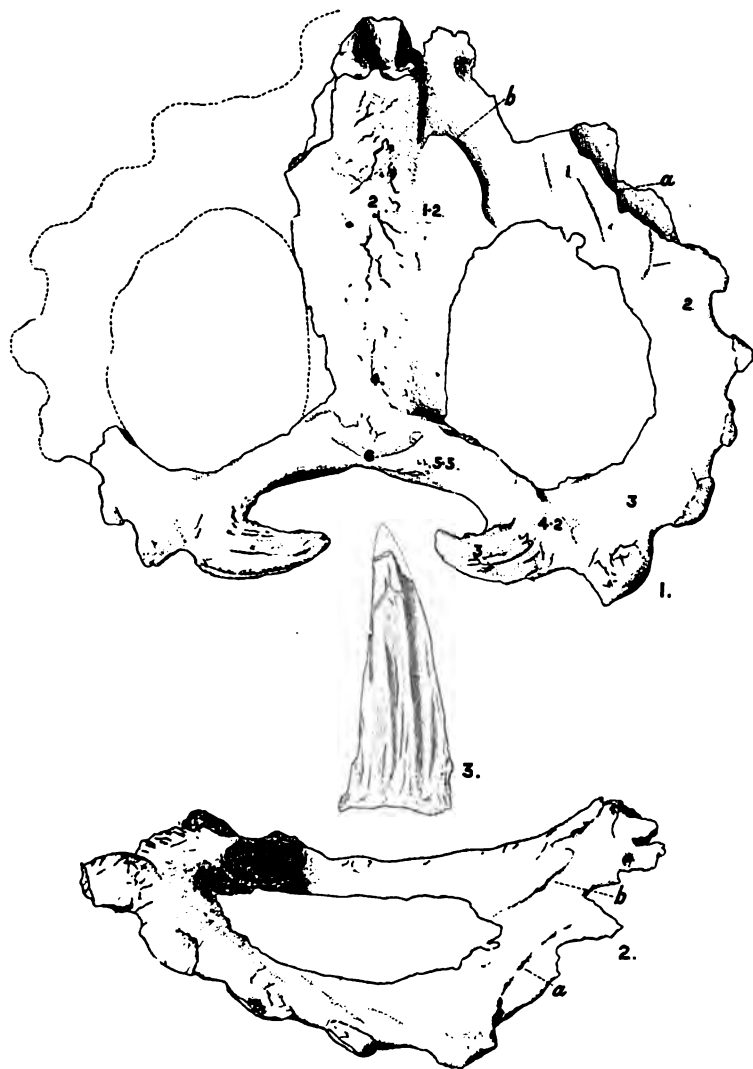
Prof. Macoun said that it was necessary, first of all, to have the desire to make a collection of plants before beginning the work. Unless the student had the desire, little benefit would be derived from it. A good herbarium was a proof that there had been a desire. In collecting plants, it is not very important what they are carried in while out in the field, providing they do not wilt before pressing. The lack of a tin case should not deter one from getting specimens, as a basket answers the purpose very well; but the best practice is to put the plants when collected into the plant press at once. A trowel or a strong knife are convenient for digging up the plants; but these again are not really indispensable, as strong fingers will dig up almost any specimen. A good plant press is a necessity, and it should be light and strong. A very strong press is made with two boards, each made of three pieces of wood nailed together. Each piece is very thin, but great strength is obtained by having the middle piece with the grain crosswise. Joined in this way the boards will stand all the pressure they will get without breaking. When taken to the field, the boards may be kept in place by means of a stout shawl strap, by which also sufficient pressure can be given. If possible, there should be two extra boards at home made of ordinary inch wood, between which the plants may be put the day after they are collected, and pressed by means of a strong strap or some heavy weight. When one is going on a collecting trip, enough papers should be put in the press for all the specimens that are likely to be obtained; but, the lighter the press, the better. Newspapers cut to about the size of the press or a little smaller and of a single thickness of paper are very convenient for putting the plants on, and filter paper or blotting paper for covering the specimen and to absorb the moisture.

When one is making a collection, it is well to try and obtain a typical and perfect plant of the species, as, once an inferior specimen is dried and mounted, one is not likely to get a better one, and perfect specimens add very much to the attractiveness and value of a herbarium. It is sometimes puzzling to the beginner

to know what is a good specimen, as a sheet will apparently only take a plant of a certain size. If the plant is a small one, the whole of it should be taken, the roots being carefully separated from the soil so as to injure them as little as possible. If flowers and fruit can be obtained on the same specimen, so much the better; but usually it is necessary to collect a plant when it is in full flower, and then when the fruit is nearly or quite full grown. In order to get the whole of a large plant on a sheet, it may be bent either once or twice, in order to do it. It is much better to do this than to lose the roots or root leaves, the latter especially being sometimes necessary in identifying specimens. If the stem or root of a plant is thick, it may be cut down its centre, leaving one side intact. Specimens of trees and shrubs may be made of branches a little smaller than the sheet, the important point being to get the whole of the flower cluster, if possible, and one or more well developed leaves. When a plant is laid on the piece of newspaper in the press, the temptation is to spread the leaves out carefully to prevent their creasing. This is a great mistake and many a fine specimen has been spoiled in this way. Some plants will stand such treatment, but many will not. As a rule, the most satisfactory way to do, is to lay the plant on the newspaper, placing the leaves or flowers so that the specimen will look fairly symmetrical and then without trying to take out all the creases in the leaves, put on the filter paper or blotting paper and press the specimen with the hand or between the boards if there is only one plant to put in. The next day, when the plant has wilted, some of the creases can be readily smoothed out; but, after the plant is pressed, these are not noticed nearly as much as when fresh; and, indeed, they sometimes look better, as when the under side of the leaves show here and there, it makes a pleasing contrast, and it is important also at times to show the under side of the leaf as well as the upper side. Some of the more delicate ferns may be dried with advantage between two pieces of newspaper, the drier being put on top of the newspaper. This avoids disturbing the specimen when changing the driers, as the upper piece of newspaper need not be removed until the plant is dry. The specimen when once laid on the newspaper should not be removed from it until it is dry. When a plant is wilted and not dry, it is very difficult and

sometimes impossible to replace the specimen without injuring them. An exception may be made with very succulent plants or fleshy plants, when both upper and lower papers should be changed to get rid of the moisture as soon as possible, and sometimes it is necessary to dip the plant in boiling water in order to kill it. Some plants retain their colour fairly well, even if improperly dried, but the majority lose their original colour unless they are dried quickly and properly. Plants should be dried as rapidly as possible after the first day, and in order to do this the driers should be changed at least once a day and, if possible, twice at first. After the first day or two, when the excess of moisture has been removed, the hotter the driers are, the better the results will be, and, in order to have the driers quite hot, they should be heated on or at the stove and put on the specimens at once. If it is not convenient to heat the papers in this way, they may be dried outside and not especially heated. As some plants dry much quicker than others, the best results will be obtained if a thin piece of wood is kept between the plants which are in different stages of drying, as, if this is not done, a plant which would dry very quickly is kept moist by others of a more succulent nature. Some plants will dry in two or three days, and some take nearly two weeks. One can easily tell by the touch when they are dry.

Many a collection of plants has been ruined by insects after it has been made, and the enthusiasm of the collector may die with the loss of his specimens. The poisoning of plants after they have been dried should never be neglected, and the sooner it is done, the better. One of the best formulas for this purpose is : Corrosive Sublimate $1\frac{1}{2}$ drachms ; carbolic acid, $1\frac{1}{4}$ drachms ; alcohol, 12 ounces. A small brush is used to apply the poison which should be painted over all the plant that is exposed, the flowers especially getting a full share, as the insects will frequently destroy the flowers when they will not injure another part. Alcohol is used instead of water, as it evaporates without leaving a stain on the paper.





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CONTENTS.

	PAGE
1. Notes concerning New Brunswick Warblers, by Wm. H. Moore	97
2. Meetings of Entomological Branch.. . . .	104
3. The Fertilization of <i>Calopogon pulchellus</i> , by A. B. Klugh. .	107
4. The Brown Pelican on Cape Breton Island, ...	108
5. Nature Study—No. 16	109

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THE BRITISH ASSOCIATION PRESIDENT'S ADDRESS, 1904.

By Prof. E. E. Prince, Dominion Commissioner of Fisheries, Ottawa.

No doubt many readers of *THE OTTAWA NATURALIST* will be interested to read a more adequate, if somewhat condensed, account of the remarkable address by the British Premier at Cambridge, England, last August, than the fragmentary references to it in our Canadian press. Hence the following notes have been prepared.

When that distinguished body of scientists, the British Association, met this year in England's famous seat of learning, Cambridge, it was appropriate that one of her most distinguished sons should be chosen President. The choice was unique, in that the *savant* chosen was also the Prime Minister of England. The name of Balfour is one held in special honor at Cambridge, for a younger brother of the Right Honorable Arthur Balfour was, until his tragic death in the Alps, the most brilliant biologist, excepting Darwin, that the ancient university has given to the world. The chair of Comparative Embryology, held by the late Professor Francis M. Balfour, has never been filled since his death. The reason, it has been said, is that no worthy successor has been forthcoming.

Premier Arthur Balfour has no mean reputation as a thinker and *littérateur*. The students of Scotland's oldest University (St. Andrews) elected him Lord Rector in 1886, and his rectorial address was a remarkable one in the field of literary criticism. Later, as Rector of Glasgow University, and at the present time, as Chancellor of the youngest of Scotland's Universities, viz : Edin-

burgh, Mr. Balfour has worthily sustained the distinction of his family name. His masterly treatises "Philosophic Doubt," "The Foundations of Belief," and other works, have given him eminence as a speculative philosopher. The late Principal John Caird, of Glasgow, once said, in my hearing, "It is easy to be a great philosopher in the company of scientists, and easy to be a great scientific man amongst philosophers; but Mr. Balfour is a great philosopher among philosophers, and a scientist among scientists." Of Mr. Balfour's real interest in science I have personal knowledge, and I well remember when I had the honor of first meeting him, that I was startled by his familiarity with a line of special zoological research in which I was at the time engaged, fifteen or sixteen years ago.

Cambridge which boasted a Newton, a Couch-Adams, and a Darwin in the past, and can claim to-day a Kelvin, and a Rayleigh and other leading scientists, was privileged to listen to a profound and closely-reasoned address on the Aim and Basis of Scientific Investigation from the President of the British Association, the membership of which Association this year exceeds 2,500.

The precise title chosen by Mr. Balfour was "Reflections suggested by the New Theory of Matter," and after pointing out that physical reality, not mere appearances or changing phenomena, formed the object of the highest scientific research, the President rapidly reviewed the ideas about matter which have prevailed since Newton's epoch-making "Principia" (published in 1687).

OLD CONCEPTION OF MATTER.

In the 17th century the average scientist regarded the universe as composed of ponderable matter, various in kind, permanent and indestructible: but capable of transformation by heat, chemical affinity, &c. Interstellar space in the vast heavens was conceived to be occupied by a thin, continuous kind of matter called ether, whose undulatory motions resulted in light, radiant heat, and electricity. Young's wave theory of light, a hundred years ago, led to the abandonment of such theories as Newton's light corpuscles or the emission by luminous bodies of material molecules which produced the sensation of light in the brain.

RECENT IDEAS OF MATTER.

In 1904 (a century later) the modern ideas as to the atomic and molecular composition of matter, the kinetic theory of gases, the laws of the conservation and dissipation of energy, so potent in 19th century science, have been surpassed by the latest affirmation that gross matter is, after all, a mere appearance, whose physical basis is electricity.

ELECTRICAL MONADS.

The chemist's ultimate atoms, whose groupings constitute the molecules of the chemical elements are now regarded as themselves groups of sub-atoms or monads. These are not electrified particles of matter; but are electricity itself. The different elements of the chemist are really different arrangements and motions of monads. "Thus" said Mr. Balfour, "two centuries ago electricity seemed but a scientific toy. It is by many declared to-day to constitute the reality, of which matter is but the sensible expression."

QUALITIES OF MATTER.

Formerly matter was said to have primary, essential qualities, such as shape and mass, which existed independent of any observer. It had also secondary qualities, like warmth and colour, which had no existence excepting as effects upon the organs of sense-perception in living beings. Mass is now pronounced to be no longer an attribute or a quality, but a relation. Far from being necessary and unchangeable, as was formerly thought, mass changes with every change in velocity, and especially at high rates of velocity. Professor Rutherford states that these corpuscles have a velocity in some cases 40,000 times greater than a rifle bullet which travels at the rate of about $\frac{1}{2}$ a mile per second. (*Harper's Mag.*, Jan., 1904)

FEEBLEST FORMS OF FORCE CHIEFLY APPARENT.

Chemical affinity, molecular cohesion and the like, hitherto so important in the eyes of the physicist, are mere residual effects, the feebler manifestations of force as compared with the intense electrical forces which keep the atom in being. Gravitation, Newton's imposing discovery, is trifling compared with the attractions and repulsions of electrically charged bodies, while these, again,

are insignificant as compared with the internal attractions and repulsions of the electric monads. Each atom of matter is the theatre of energetic forces, however inert may be its external relations.

UNITY THE AIM OF SCIENCE.

"Will this bold attempt to unify physical nature last?" asked Mr. Balfour. A world built-up out of sixty or seventy eternally different chemical elements is just as rational a conception as if it were constructed out of a single medium: but men of science have always been impatient of multiplicity. Reduction of plurality to unity is a scientific instinct not to be ignored.

EXPERIENCE UNTRUSTWORTHY AS A SCIENTIFIC BASIS.

The President then considered the basis of experience upon which scientific research founds its laborious investigations. Scientists formerly held that to go behind experience was impossible, yet Faraday's disbelief in that *dictum* led to the modern electrical theory of matter. Gravity itself, says the physicist to-day, must be explained, it is no longer held to be an ultimate property of matter admitting of no explanation and requiring none. Matter itself, in masses or in minute particles, molar or molecular, is resolved by recent science into that which is not matter at all. The minute particle, called the atom, is a relatively vast theatre in which the sub-atoms or electrical monads perform their evolutions. The minuteness of these monads may be judged from Prof. J. J. Thomson's statement that radium throws off, as cathode rays, streams of these corpuscles, each of which has a mass of about one-thousandth part of the hydrogen atom and thus they are the smallest bodies known to science. (See *Harper's Mag.*, l. c. p. 279).

SCIENCE CONTRASTS WITH COMMON EXPERIENCE.

Matter, as viewed by scientists, could hardly be more divergent than it is from prevailing ideas or common experience, yet all science must inevitably be based upon experience, which is really but another name for the perceptions of the bodily senses.

EXPERIENCE WHOLLY ILLUSORY.

Starting from experience, scientific thought yields conclusions which prove experience to be misleading. "Our knowledge of reality" Mr. Balfour pointed out, "is thus based upon illusion,

and the very conceptions by which we describe it to others or think of it ourselves are abstracted from anthropomorphic fancies, which science forbids us to believe and nature compels us to employ."

INDUCTIVE THEORY INADEQUATE.

The school of John Stuart Mill held that the task of science ended if the sequences of our individual sensations were accounted for. Mill's "Logic" dealt with succession and co-existence in phenomena, with methods of agreement and difference, with the laws of nature as observed uniformities and nothing more. The inner character of physical reality was of no concern to science. This "thin intellectual fare" as the President styled it, is what was served out under the imposing title of Inductive Theory.

IF BODY AND MIND ARE EVOLVED WHAT FOLLOWS?

Our organs of sense (eyes, ears, touch, &c.,) inform us that there is a physical world : but science says the constitution of our organs, our eyes, our ears, &c., whose reports are really sense-perceptions, has reached its present condition by evolution or natural selection. So also have our intellectual powers. Utility has decided everything ; what is fittest alone survives. Man's physiological and mental outfit, adapted to the highest scientific inquiries, are due to blind forces, which have no prevision of loftier uses. The rudimentary instincts of the animal have thus been perfected into powers of analysis and calculation enabling man to mete out the heavens or divide the atom. The imperfection of man's ordinary beliefs and ideas, based upon illusory experience, may be due to these circumstances and to this genesis. Too accurate and direct a vision of physical reality might have been a disadvantage in the struggle for existence. Falsehood being, perhaps, more useful than truth, and living tissues (composing the organs of sense) being such imperfect material, no better results could be attained. This applies to the senses : but it must also apply with equal force to the intellectual powers.

SCIENCE GIVES NO COHERENT INTERPRETATION.

If evolution thus provides man with untrustworthy instruments for obtaining knowledge, or rather sensations, the raw material of experience ; why should it succeed better in regard to reason, whose task is to turn experience to higher account.

Evidently something is wrong with the purely scientific explanation of the acquisition of truth and reality. As Mr. Balfour declared, there is "a certain inevitable incoherence in any general scheme of thought which is built out of materials provided by natural science alone." Knowledge, which science regards as the final outcome of irrational (animal) conditions, must be pronounced essentially rational, or science itself disappears.

As the speaker claimed, in an eloquent passage :—

"Extend the boundaries of knowledge as you may ; draw how you will the picture of the universe ; reduce its infinite variety to the modes of a single space-filling ether ; retrace its history to the birth of existing atoms ; show how under the pressure of gravitation they became concentrated into nebulae, into suns, and all the host of heaven ; how at least in one small planet, they combined to form organic compounds ; how organic compounds became living things ; how living things, developing along many different lines, gave birth at last to one superior race ; how from this race arose, after many ages, a learned handful, who looked round on the world which thus blindly brought them into being, and judged it, and knew it for what it was—perform, I say, all this, and, though you may indeed have attained to science, in nowise will you have attained to a self-sufficing system of beliefs."

Thus, the more complete seems to be our explanation of what we know, the more difficult it is to discover by what ultimate criteria we claim to know it. The President concluded by confessing that the dilemma was not one for physical science to remove, for here the confines of a territory were touched where philosophy claims jurisdiction.

If the senses and instincts of the lower animals are inadequate to yield a true conception of the universe in which we find ourselves, and if these, more refined and highly developed in man, are still unreliable and misleading in the ordinary human mind at any rate, and furnish, under the name of "experience" or "common sense," grossly erroneous conclusions as to the realities of existence, the resulting paradox is strange indeed. The latest product of human evolution, the scientific intellect, in its highest and most daring flights, is compelled to rely more and more, not upon actual common experience, but upon idealistic interpretations of the universe. Such interpretations transcend the crude reports of sense-perception : but they mould the results of experience and sense-perception into harmony with ideas, preconceived and necessary and full of light and satisfying meaning.

DISCOVERY OF THE EGGS OF SOLITARY SANDPIPER.

By WALTER RAINE, Toronto.

At last the long-sought for eggs of the solitary sandpiper have been found and it affords me much pleasure to be the first ornithologist to have the opportunity of recording its nesting habits, which are unique amongst North American birds, for I have positive proof that this species lays its eggs in the nests of other birds ; this being one of the most important discoveries in recent years in regard to the nidification of any American bird.

In "Nests and Eggs of British Birds Non-Indigenous," Mr. Chas. Dixon says of this species :—

"Incredible as it may seem the nest and eggs still remain unknown to science, for it is impossible to accept the description of the latter given by the late Dr. Brewer without authentication. There can be little doubt that this species lays its eggs in the discarded nests of other birds in low trees like its old world representative the green sandpiper is known to do, search should be made in such places in the summer haunts of the species."

I am aware that other ornithologists have previously recorded what were supposed to be eggs of the solitary sandpiper, but most of these records were simply conjecture and very unsatisfactory. The egg recorded by Dr. Brewer, according to the description that he gives, was doubtless that of the piping plover, the nest being found on the ground, and it will now be seen the solitary sandpiper does not make its nest on the ground.

Another supposed nest of this species was recorded by Dr. Clark of Kingston, Ont., in "The Auk" for Oct., 1898. This same nest was also recorded in THE OTTAWA NATURALIST for December, 1899, by the Rev. J. C. Young, but this nest was found on the ground and the parent was not secured. Mr. C. A. Reed in his work "North American Birds Eggs," figures one of these eggs found by Dr. Clark and it resembles a variety of the spotted sandpiper. The eggs of the solitary sandpiper are larger and more pear shaped than any spotted sandpiper egg I have seen, and the texture of the shell is very different to that of the spotted sandpiper, being a fine grain and polished ; then the ground color is pale greenish white, a tint never seen in a spotted sandpiper egg.

The genuine eggs of the solitary sandpiper are entirely different from spotted sandpiper eggs, in fact there is no American sandpiper egg that has the slightest resemblance to that of the solitary sandpiper. They bear a family likeness to eggs of the European green and wood sandpipers as might be expected, but of course like the birds themselves, the eggs are smaller than those two species of European sandpiper.

Now for my records which are absolutely authentic and thoroughly conclusive and establish once for all the fact that the solitary sandpiper does not lay its eggs on the ground, but deposits them in the nests of other birds often at considerable distance from the ground.

In the spring of 1903, I engaged Mr. Evan Thomson, to collect birds eggs for me in northern Alberta, and when the season was over he sent me notes on the specimens he had collected, amongst which was a record of finding a clutch of sandpiper eggs in an old American robin's nest built in a tree top.

I felt sure these would turn out to be eggs of the solitary sandpiper, and in due time the eggs were sent down and I saw at a glance, the eggs were new to me, but as they very much resembled a set of green sandpiper eggs in my collection, except being smaller in size, I was sure I had at last secured a genuine clutch of solitary sandpiper eggs. Several ornithologists who called to see my collection of birds eggs confirmed my opinion that this was a genuine set of this species. Amongst those who saw them, I may name the Rev. C. J. Young, Madoc, Ont.; Mr. Ed. Arnold, Battle Creek, Mich.; and Mr. Ed. Reinecke of Buffalo, N.Y.; but I thought I would wait for another year in the hope that Mr. Thompson would find another clutch and secure the bird, and in this he was very successful; as the following letter shows :—

“This season on June 9th, I found another set of solitary sandpiper eggs, this time in a grackle's nest in a low tree. I blew the eggs and left them until the next day, intending to return with my gun and shoot the bird, but on again visiting the nest, I found the eggs had gone, evidently the bird had removed them as I saw no trace of egg shells around. However, on the 20th June, I was still more fortunate, as I found another clutch and shot the parent bird as she flew from the nest and secured the four fresh eggs

This time the eggs were found in a cedar waxwing's nest in a spruce tree out in a swamp or muskeg."

The following is a description of these nests of solitary sandpiper eggs.

SET I.—Taken in northern Alberta, June 16th, 1903. 4 eggs advanced in incubation, collector, Evan Thomson. This set was found in an old nest of the American robin, built 15 feet up in a tamarac tree, that was growing in the middle of a large muskeg, dotted with tamaracs, the bird was flushed off the nest but unfortunately not secured. The eggs are exceedingly handsome and very different from the eggs of any other American sandpiper. The ground color is pale greenish white, heavily blotched and spotted, chiefly at the larger ends with vandyke brown, chestnut brown and purplish grey, the average size of these 4 eggs is 1.36 x .98, and they are very large for the size of the bird.

Set II.—Northern Alberta, June 9th, 1904. 4 eggs found in the nest of a bronzed grackle, built in a low tree; these eggs were unfortunately lost owing to Mr. Thompson first blowing them and then leaving the shells in the nest until he returned with his gun to secure the parent bird, but on his return on the following day, no trace of the eggs were to be found, the bird evidently had carried them away.

Set III.—Northern Alberta, June 24th, 1904. 4 eggs found in the nest of a cedar waxwing, which was built in a small spruce tree growing in a swamp, the nest being about 5 feet from the water, and Mr. Thompson was fortunate in shooting the parent bird as she flew from the nest, and thus identification is very complete and established the fact once for all, that the solitary sandpiper does not lay its eggs in a nest on the ground like other sandpipers, but takes possession of the nest of other birds, built in trees, just the same as its old world representative the green sandpiper is known to do.

The ground color of this clutch is also pale greenish white and the eggs are spotted with purplish brown, vandyke brown and purplish grey, and average in size, 1.36 x .99, thus it will be seen they average larger than eggs of the spotted sandpiper which measure about 1.34 x .90. Both clutches with the skin of the parent solitary sandpiper together with the nests are now in my

collection for the inspection of ornithologists. The finding of the eggs of the solitary sandpiper now makes the seventh species whose eggs were unknown to science until discovered by myself and assistant collectors in northern Canada. The other species whose eggs were previously unknown are Richardson's merlin, greater yellowlegs, belted piping plover, Nelson's, Leconte's and Harris's sparrows. The four latter species we found nesting in Manitoba, while the eggs of Richardson's merlin and the greater yellowlegs were discovered in Alberta.

OBSERVATIONS ON SOME OF OUR RARE BIRDS MET WITH IN 1904.

By Rev. C. J. YOUNG, Madoc, Ont.

In an earlier number of the OTTAWA NATURALIST, I recorded the appearance of the evening grosbeak in the neighborhood of Kingston in the months of February and March; also of the appearance of the horned lark at its usual time in spite of the bitterness of the winter. I will now refer to a few birds I met with this past season.

The goshawk is a not uncommon winter visitor to Ontario; it breeds occasionally, and is one of the earliest of our hawks to do so. I have previously recorded a nest found near Perth in 1885. On the second of May, it contained three eggs, incubation commenced. On the 22nd April, in the present year, a nest was located in the township of Oso, while snow was still deep in the bush, and the ice on our lakes was strong enough for a person to cross; at that date the nest contained three fresh eggs, unspotted and of a decided bluish tint. Both of these nests were located in beech trees about 45 feet from the ground, as also was one observed in the township of Elzevir, which in June contained two well grown young ones.

The red-shouldered-hawk breeds regularly in N. Frontenac, but the further one goes north, the rarer this bird becomes. It is also an early breeder, laying in the latter part of April, and selecting any suitable tree, very often a maple, sometimes an ash, oak,

beech, elm, pine or hemlock, in all of which trees I have seen the nest.

The red-tailed-hawk is quite rare in eastern Ontario, I have no knowledge of its nesting along the St. Lawrence though I have seen the bird. In the rougher parts of the country northward a few pairs do so, and this year a nest was located in the township of Olden, in a high black ash, which on May 21st contained two eggs, highly incubated.

The vicinity of Sharbot Lake is the summer home of many warblers, and some of the fly-catchers. Of the latter I have observed the king bird, the great-crested, the olive-sided, the wood peewee, the phoebe, Traill's fly-catcher (Var. *alorum*), and the least fly-catcher. Of the former, the yellow warbler, the myrtle warbler, the magnolia warbler, the black-throated green, the black-throated blue, the blackburnian, the palm warbler, the Maryland yellow-throat, the oven bird, the water thrush, the Canadian warbler, and the red-start, along with two or three varieties, that I could not identify, are frequent. All the above breed, and during the past season, I saw nests of magnolia, June 6th, in a small black spruce, containing four young ones just hatched; on the same date a black-throated-blue warbler's in a maple sapling, with two fresh eggs; also a red-start's with four eggs; and on May 27th, a water-thrush's just ready for eggs. But none of these birds is rare compared with the olive-sided fly-catcher, which I located on the 6th June, in the same black spruce swamp, where I found the magnolia warbler. In the open spaces, patches of arctic huckle-berry grow round the scattered spruces, and amid the springy moss, were the largest pitcher-plants then in flower, I had ever seen. A short distance away, outside a belt of spruces were many plants of the beautiful lady's slipper, *Cypripedium acaule*; and not far off the bright waters of Sharbot Lake. In a black spruce eighteen feet high, the olive-sided fly-catcher had established his home. The nest was built on a horizontal bough thirteen feet from the ground, and on June 6th, contained two eggs. Later, in the swamp on June 23rd, I found another of these nests containing three eggs, incubation commenced. It probably belonged to the same pair of birds, as it was not more than fifty yards from the first nest, but was built in

a much larger black spruce, on a horizontal bough, twenty-five feet from the ground. I had never seen this bird in its breeding habitat before, or had even met with it. On the above occasion, while walking through the little swamp, my attention was attracted by its loud and singular call or alarm note. It would sit on the topmost dead branches of the trees and rapidly repeat three times syllables, which one writer compared to 'quirk,' 'quirk,' but which I thought more resembled three creaks of a rusty door hinge. The bird is very restless in the vicinity of its nest, continually on the move; the nest itself is built of small, dry tamarac and spruce twigs, interwoven and lined with tree lichen and moss.

I might mention several other birds as met with in this locality, but space forbids, so I must leave them for the present; I will only refer to the solitary sandpiper. I wrote a short paper on this bird, which appeared in the OTTAWA NATURALIST, of December, 1899. There I stated my observations on the bird up to that date (1899) and concluded with an account of a nest and three eggs found by me near a creek on Amherst Island, the identification of which I considered at the time absolutely indisputable. The nest was on a sandy knoll, near a creek; the flight of the bird was peculiar, but what I most of all relied on, were the evident whitish features of the tail.

Subsequent developments however, lead me to suppose that my identification was faulty, for Mr. W. Raine of Toronto, received from Alberta, two sets of eggs, taken from the disused nests of other birds built in trees, which if his correspondent is correct, certainly belong to this species. I have seen one of these sets of eggs and am impressed with their resemblance to eggs of the greenshank, green and wood sandpipers of Europe, but of course they are smaller, as they should be. It should be remembered that Mr. Charles Dixon, the writer of 'non-indigenous British birds,' in writing of this species some years ago, said "there can be little doubt that this species lays its eggs in the deserted nests of other birds in low trees, like its old-world representative, the green sandpiper, is known to do." Dr. Brewer's record and my own with regard to these eggs are unsatisfactory.

As a supplement to my former paper, I may add I did not meet with the solitary sandpiper after 1899, until May 22nd, 1903, when

I saw a bird at a small lake in the township of Olden. This year 1904, I saw an unmistakable bird in immature plumage, with down still adhering, rise from a pool by the road-side in dense woods in the township of Kennebec, on 6th July. But as proof of their breeding in this part of Ontario, I will relate my experience this summer near Madoc, in the county of Hastings. I was driving past a road-side pool near a swampy meadow on 24th August, when several sandpipers rose, and alighted on the neighboring fence. I stopped the horse and watched them. They were a brood, four young with the two old ones: were very tame; they would fly down to the muddy pool, then alight on the fence again, would sometimes perch on a stump on the dead branch of a neighboring tree. I could get within eight or ten feet. I thought a photograph would be interesting, so I came another day, but could never get more than two on the fence together. I obtained photographs to that extent, after visiting the location on several afternoons. The last time I saw any of them was the 16th September. This brood was doubtless hatched in the vicinity, and having been undisturbed, will probably locate themselves there another year, if they survive the migration. I have heard from boys, whom I met near by, of a snipe's nest having been found last spring in an apple tree, and was assured by them that the bird flew out, and until they saw this nest they always thought the snipe made its nest on the ground. This had reference to the solitary sandpiper.

But not much dependence can be placed on such a statement, and until I see the nest, and examine any fragments of egg shell there may be in it, I only mention the statement for what it is worth.

Madoc, September, 1904.

THE CANADA JAY.

(By WM. H. MOORE. Scotch Lake, N.B.)

The Canada jay (*Perisoreus canadensis*) is one of our Canadian birds which is blessed with several local names. Some of these names are "camp-robber," "whiskey-jack," "moose-bird," and "gorbie," but speak of this bird as Canada jay to most of his human acquaintances and they know not what bird is meant.

The Canada jay is one of our most hardy birds. So hardy in fact, that not only do the adults withstand our severe winters, but they even build their nests and bring forth the young while snow still covers the ground. The nest is a compact affair, built of twigs, fine shreds of bark, and hair, and if wool is obtainable it is added.

The plumage of the young, is much darker than that of the adults, being sooty black throughout with a slight tip of white on tail feathers. The white of the head and neck is lacking until August or September, when they have assumed the same colored dress as the older birds, being greyish with white cheeks, throat and collar, forehead, and tip of the tail. When on the wing they seem to float on the air, rather than to be working vigorously with the wings as some birds do. A cause of prejudice against the Canada jay is the manner in which at times they obtain their food. They are much disliked by trappers and hunters, as they often take the bait from traps set for fur-bearing animals, and also by feeding upon carcases of game hung up by hunters. Many hunters have lost shots at game on account of this bird giving a cry of alarm when it sees a man, and as all of the wild neighbors partially understand the calls and actions of their friends, all know to be on the *qui vive* when an alarm call is given. Campers also dislike its way of taking any bit of food that it can carry away, yet some campers delight in feeding the birds just to see them eat, and carry away what they cannot eat. Anything from a small bone, bread-crust, or piece of soap is acceptable to their needs; whatever it may be, it is picked up in the bill, and while on the wing it is changed to a foot, and changed as easily

as you or I could change a like article from one hand to the other. But all do not live all the time by camp robbing, or trap-robbing. If they did many of the names applied to them would be well earned.

Let us see the Canada jay from an economic, a beneficial point of view. This will bring to light other habits and a different food supply. Small mammals, killed by the birds themselves, are part of the bill of fare, and insects in all stages of life form a large part of the menu even among camp fed birds.

The writer performed a surgical operation upon a Canada jay which had been in the habit of dining with a crew of lumbermen, and was much surprised to find that nearly one thousand eggs of the Lorset tent-caterpillar had been taken for breakfast. The chrysalids of this caterpillar are also fed upon, and in the autumn while the birds are migrating south they feed largely upon locusts, beetles, etc. The young taken in June feed upon beetles and caterpillars, species well known to the birds but unknown to the writer.

What real naturalists our wild birds are, knowing how, when and where to find and obtain their food supply, be it insect in any of its stages, plant forms, or other life. Were we able to understand our wild neighbors what a great amount of information could be gained regarding the life histories of many forms of life.

A most interesting entertainment to witness is when the Canada jay turns his attention to collecting mice. Not only is it interesting to witness but from appearances the performances is highly interesting to both jay and mouse. A Canada jay was heard shrieking and calling in such a manner as to call the attention of man. A mouse had been running over the snow from one burrow to another when it was espied by the sharp eye of the jay, who immediately gave battle by flying down and catching the mouse in its bill, whereupon the mammal turned upon its foe and prepared to defend itself by trying to bite the bird, but the jay seemed aware of such tactics and suddenly dropped its prey. The mouse sprinted for cover, but was again held up. These tactics were followed until the mouse had become too badly injured to run, when it was most viciously seized and pecked to death. With screams of vic-

tory the jay made his way to a stump where the mouse was added to various other products of Nature in the internals of *Perisoreus*. To sum up both sides of the case, for and against the Canada jay, I for one think we should put down the verdict thus : Canada jay highly beneficial from the habit of feeding upon insects and mammals injurious to the welfare of man.

There are three sub-species of the Canada jay, viz : (*Perisoreus canadensis nigricapillus*) having a blackish crown. Inhabiting the the coast region of Labrador north to Ungava Bay. (*P. c. fumifrons*,) in which the white of forehead is smoky colored, inhabiting Alaska.

(*P. c. capitalis*.) The white species, especially about the head, larger than *canadensis*. Rocky mountain region of U. S.

BIRD NOTES.

RUFFED GROUSE.

Dr. Fletcher's note in the December, 1903, number, reminds me of a similar incident which occurred some years ago at Beacon Hill park here, during the progress of a cricket match. One of these birds was flushed by a dog on the opposite side of the park and came flying over the field where it was terrified by the shouting and yelling of the crowd. It made straight for the nearest cover, where the Park Hotel stood, flying at a great velocity. The hotel door stood open and just opposite was a large mirror, the poor bird went through the door and against the mirror, falling dead on the floor.

J. R. ANDERSON.

Victoria, B.C., 4th January, 1904.

BIRD MIGRATION.

Mr. E. A. Wright of Ottawa, noted on the morning of October 9th, at 3.35 a.m., a migration of many thousand birds which from their note he took to be some species of plover. They continued to pass over for about an hour, when he fell asleep. Mr. Wright noted that the birds seemed to be flying very low, and from the difference in their note it was evident that some of them rested for a short time.

J. M. M.

NATURE STUDY—No. XVIII.

THE PRESCRIBED COURSE IN NATURE STUDY FOR PUBLIC SCHOOLS.

S. B. SINCLAIR, Ph. D.

The Easter meetings of the Ontario Educational Association held in Toronto, have for several years been devoted almost entirely to the consideration of new courses of study for Public and High Schools.

As a result of this investigation the regulations regarding the subject matter of study in these schools have been greatly changed. One of the most radical of the reforms made is the introduction of Nature Study into every grade of the Public School. The December number of the *NATURALIST* for 1903 contains an outline of the course which was proposed. As a number of alterations were made before adoption it has been thought better to give the following copy of the revised courses, which are now compulsory in the first four classes of the Public School.

Form I.

NATURE STUDY.—Animal life : General appearance and habits of pet animals, their care and food ; domestic animals on the farm, their care, habits and uses ; birds, their nesting, song, food, migrations in the autumn ; metamorphosis of a few conspicuous butterflies or moths.

Plant life : Work in school garden or in window boxes ; study of a plant, as a geranium or pansy, from slip or seed to flower ; caring for plants in pots ; buds, their preparation for winter, their development ; autumn leaves, collections, forms, tints ; economic fruits, collection, forms how stored for winter, fruit as seed holders, dissemination of seeds ; roots and stems, uses, comparison of fleshy forms, how stored for winter.

Life on the Farm : Harvesting, primitive and modern methods compared ; preparation for winter ; the barn and its uses ; activities of the farm during winter ; winter sports and social life on the farm ; the varied operations of spring time ; spring time as awakening to new life ; effects of sun and moisture on the soil.

Form II.

NATURE STUDY.—Course of Form I. continued. Animal life : Life history and habits of domestic animals and of a familiar wild animals, as the squirrel, chipmunk, robin, crow ; earth-worm, habits, structure, uses ; toad, habits, structure, uses ; observation of live insects and their activities, comparison of young and adult stages.

Plant Life : Co-operative and individual work in school garden ; cultivation of plants in pots with observation of the development of leaves and flowers , parts of leaves and flowers ; change of flower to fruit and of fruit to seed ; functions of the parts of flowers ; the forms and uses of trees ; activities connected with forestry and lumbering, with study of pioneer life and present conditions on the prairie.

Observation of farm, garden, and household operations.

Form III.

NATURE STUDY.—Course of Form II. continued.

Animal Life : Adaptation of different kinds of Animals to their respective habits and surroundings ; birds, life history of types, habits of wild fowl in different seasons ; fish, forms and uses of different parts of the body, food and how obtained ; life histories of moths, butterflies, beetles and grass-hoppers ; useful insects, as ladybird and dragon fly ; harmful insects ; Nature's insecticides.

Plant Life : Germination of seeds under controllable conditions and in the school garden and window boxes ; opening of buds ; study of the forms and functions of the parts of plants, and comparison of these forms and functions in different plants ; observation of the culture of farm and garden crops and of orchard and shade trees ; the observing and the distinguishing of the common forest trees.

Different kinds of soil, as sand, gravel, loam, leaf-mould and clay ; experiments to ascertain how soils are composed, whether of mineral or of decayed organic material, and which best retains water. Additional phenomena of spring in the vicinity of the school, cause of snow melting, ice floating, etc. ; how nature prepares the soil for growth of plants. Distinction between hard and

soft, pure and impure water ; tests and methods of impure water ; tests and methods of purification of water.

Sources of heat : Experiments to show the effects of heat in the expansion of solids, liquids, and gases ; practical applications. Temperature ; thermometer, construction and graduation Methods of transmission of heat, conduction, convection, and radiation ; causes of winds and ocean currents ; ventilation.

Form IV.

NATURE STUDY.—Course of Form III. continued Animal life ; relation of fish, birds, and wild animals to man ; life histories of conspicuous and economic insects ; organs and functions.

Plant life ; study of organs of plants and their functions ; study of economic and wild plants from seed to fruit in the school garden, home garden, farm and forest ; weeds injurious to crops and methods of destroying them ; buds and twigs : wood, rings, grain, and bark, uses, etc.

Observing local minerals and rocks, their properties and uses ; experiments to show composition of soils and their relation to drainage, temperature, etc. ; varieties of soils adapted to different crops ; fertilizers, etc. Implements and tools used on the farm and in the household, mechanical principles applied in their construction.

The atmosphere ; its composition ; combustion, simple experiments, study of candle flame products ; changes produced in the air by respiration ; reciprocal relation of plants and animals as regards the atmosphere ; impurities in air.

Gravity ; air and liquid pressure, the barometer. Cohesion and adhesion, the nature of these forces ; phenomenon of solution and diffusion ; amorphous and crystalline forms of matter. Practical use of heat, steam, and electricity, in connection with the study of industries.

Form V.

ELEMENTARY SCIENCE.—An elementary course in Botany, Zoology, and Physics.

For the details of the course, see Appendix B., p. 82 of printed Regulations of the Education Department of the Province of Ontario.

NOTE 1.—The objects of the course are to train pupils in correct observation and deduction ; to give, in connection with the instruction in Geography, a fair knowledge of the world around them to those who will remain at school only a year or so ; and to lay the foundation for the more detailed study of each subject in the case of those who will continue the work. The spirit of the Nature Study of the lower form should be retained, but the teacher should introduce a more systematic treatment of the subject with organization of the material in Botany and Zoology as will lead to simple classification. The course should be correlated with Geography, Drawing and Composition.

NOTE 2.—Under each of the sub-heads in Appendix B, full details are given of the courses. The order of the topic, however, is merely a suggested one. In Botany and Zoology, the extent and the character of the details of each topic are left to the principal and the teacher, and should be determined by the accessibility of the material and other local considerations. The course in these subjects should be practical throughout. Each pupil should possess a good lens and be taught how to use it. Approved methods of collecting and preserving botanical specimens and of keeping live animals suitable for study should be systematically followed. An herbarium and a museum of local specimens should be provided where practicable. The pupils should be encouraged to provide specimens from the locality. Much of the practical work, especially the observations, will necessarily be done out of doors by the pupils alone, under the direction of the teacher, or by the pupils, conducted by the teacher. The course in Physics shall be experimental as far as possible, and the pupils should be encouraged to work at home and to prepare simple apparatus. The amount of the apparatus required is at the discretion of the Public School Inspector.

NOTE 3.—Books for reference and for supplementary reading should be provided in the school library. Systematic written descriptions and drawing should be required throughout the course, and the exercises should be dated and presented for comparison and inspection, the work being systematically supervised by the teacher. In none of the science subjects shall notes be dictated by the teacher.

NOVEMBER, 1904.

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CONTENTS.

	PAGE
1. Summer Warblers in Compton County, Quebec, by Lewis M. Terrill	149
2. Unusual Nesting Sites of the American Merganser, by Walter Raine	153
3. Ornithological Notes	154
4. An October Tramp	155
5. Botanical Branch	157
6. Reviews..... ..	159
7. Nature Study—No. 10	161

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No. 8

SUMMER WARBLERS IN COMPTON COUNTY, QUEBEC.

By LEWIS M. TERBILL, Montreal, P.Q.

The district in which the following observations were made comprises an area of about five miles in the vicinity of Bury, Quebec, a village in Compton County on the C.P.R. almost equidistant from Sherbrooke and Megantic.

Lumbering has only recently become extensive and the forests are still large, with coniferous trees predominant. The country is hilly and well watered, forming an ideal summer home for many warblers and other birds of a retiring disposition.

BLACK-THROATED GREEN WARBLER.—My notes on this species are based on three nests and if others should be found to continue in a relative similarity, a description of one would suffice. The first, found June 1st, 1902, was fastened, one foot from tip, on to limb of a small shrubby spruce, three feet from the trunk and six from the ground. The spot chosen was a side hill covered with a growth of young spruce and cedar. The nest, well hidden by an overhanging branch held four fresh eggs and was composed exteriorly of dead spruce twigs neatly interwoven with yellow birch bark shreds and lined with fine grasses and animal hair. Its inside diameter measured $1\frac{3}{4}$, outside 3 inches; inside depth, $1\frac{3}{4}$, outside, $2\frac{1}{3}$ inches. The well rounded and finished appearance and the predominance of birch bark reminded me of certain vireos' nests. Two nests found later, on June 9th and 20th, were similarly situated and consisted and contained respectively four fresh and one adled egg. The eggs measure uniformly .66 x .49 are white distinctly and obscurely dotted, chiefly at the larger end, with varying shades of rufous brown and lilac and a few distinct spots of black.

BLACK AND WHITE WARBLER.—June 5th, 1902. I saw a pair which evidently had a nest near by. Not otherwise observed during the breeding season though common about the 10th of May.

BLACKBURNIAN WARBLER.—July 12th, 1902. I saw a pair in an open spot of spruce woods, caused by surveyors felling several trees whilst staking out a line. They were much disturbed by my presence and probably had young.

CANADIAN WARBLER.—I saw a pair June 5th, 1902, and noticed others at different times through summer months.

NASHVILLE WARBLER.—June 12th, 1902. As I emerged from spruce thicket into an alder grown portion of a blueberry swamp, I noticed one of this species fly from a mossy knoll and after considerable searching found the nest deeply embedded in the yielding side of the mound. It was a slight affair (the surrounding mosses rendering a more substantial structure unnecessary) of withered grasses, moss and rootlets, containing four young a few days old. I saw several others during the breeding season principally amongst the undergrowth in boggy places.

MAGNOLIA WARBLER.—One of the most common warblers in this district, breeding in localities similar to those that the black-throated green and myrtle frequent. A nest found June 5th, 1902, was fastened, six feet from the ground and four from the trunk, on to a well foliated limb of a small shrubby spruce, situated on the outskirts of a hilly spruce-grown pasture land, almost surrounded with deep woods. The female was on the nest, which was composed of very fine blackened grasses loosely fastened with spiders' silk and lined with horsehairs, appearing very fragile and transparent, somewhat similar to nests of the chipping sparrow. It was well concealed by an overhanging branch and measured inside depth $1\frac{1}{3}$, outside $1\frac{3}{4}$ inches; inside diameter 2, outside $3\frac{1}{4}$ inches. The eggs, four in number, averaging .63 x .48 and quite fresh, were washed on the larger ends with a pale shade of cinnamon brown encircled with a wreath of spots of rusty brown and lilac in varying shades, on a creamy white ground. On June 16th another nest $2\frac{1}{2}$ feet from the ground resting on twigs of a small cedar brush, the topmost foliage partially concealing it, was composed of fine grasses, black rootlets and spruce twigs, loosely

bound with spiders' silk and lined with horsehair. Locality, a dense growth of small spruce, cedar, tamarac and alders, gradually merging into a large forest. This nest also held four fresh eggs, creamy white, encircled on the larger ends with a wreath of brownish purple markings, and averaging $66 \times .49$.

Other nests show that the eggs vary considerably more, in the coloring, than do those of the black-throated green warbler, one nest containing eggs finely dotted over the entire surface with light grayish brown. In this locality the Magnolia warbler commences building about the first of June and four eggs, I found invariably, to be the complement. Two nests noticed on the 15th and 20th of June contained young newly hatched.

MYRTLE WARBLER.—This species appeared to be more abundant than any of those previously mentioned, excepting, perhaps, the Magnolia. They commence nest-building about the latter part of May, about one week earlier than the Magnolia. Their nests are very substantial and warmly built, one found June 3rd, 1902, with five eggs incubation 1-5th, was composed chiefly of dead spruce twigs with a few grasses and rootlets, bound with spiders' silk and thickly lined with feathers and animal hair. It was four feet from the ground, built close to the trunk of a young slender spruce with scanty foliage, situated in a spruce grown pasture skirting the swamp. The dimensions of this nest were, inside diameter 2, outside 4 inches; inside depth $1\frac{1}{2}$, outside $2\frac{1}{4}$ inches.

Eight out of ten nests discovered were placed a few feet from the ground near the top of slender spruces, the characteristic material used being a predominance of spruce twigs with a lining of feathers. Five eggs, less commonly four, composed a set and it would be vain to attempt a description as they show great variation; though in one instance, when I was enabled to examine two sets laid by one female, consecutively on June 10th and 24th, the markings were similar, though curiously enough the second nest held five and the first but four eggs. The nest found on June 10th was disturbed, hence the second laying as this species, in common with other warblers, normally breeds, as far as I am aware, but once a year. Measurements also differ considerably, the largest found being $.76 \times .58$ and the smallest $.64 \times .51$, the largest being nearer the average. This warbler is one of the last

of the family to leave for the south, large flocks remaining until October 20th. I saw a few feeding in an orchard in the village as late as October 24th.

CHESTNUT-SIDED WARBLER.—Arrives here during the second week of May and many remain to breed. Its nest is usually a slight affair of grasses and vegetable fibres placed in the crotch of some small shrub or sapling amongst deciduous second growth. A nest found June 7th was very compactly built for this species. It contained four fresh eggs and was placed in a triple crotch of a basswood sapling amongst undergrowth in a well timbered locality. It was two feet from the ground and composed of shreds of yellow birch bark. Coarse bleached grasses, well woven and bound with a large quantity of spiders' silk, ornamented with numerous basswood bud coverings and with fine rootlets and horsehair.

This bird showed great foresight in placing the nest, as it was completely hidden by a large basswood leaf, though a week previous, during development of nest and leaves, the nest was in plain view. In the several nests I examined in this district the number of eggs deposited was invariably four. The uniformity, with regard to the number of eggs in a set, of the several warblers enumerated, may perhaps be partially ascribed to the absence of that parasite the cowbird, which appears not very partial to newly settled districts notwithstanding an abundance of cows. I did not find any warblers' nests containing eggs of the cowbird, in fact the only individual intruded on was a bluebird, and in this instance the would-be cowbird did not mature as the egg, with three of the bluebirds, was frozen during the severe frosts of May 9-10th, 1902.

The American redstart and Maryland yellow-throat were fairly common, though not nearly so abundant as in Montreal.

The yellow warbler, one of the most common summer residents in Montreal, was notable by its absence, as I did not see a single specimen either as summer resident or migrant.

One nest of the ovenbird was found July 1st, 1902, not arched though built higher on the side furthest in the hollow of the mound in which it was located, containing four eggs. I found this species fairly common in damp woods, and their song was very noticeable at night from 9 to 11 o'clock, during the breeding season.

UNUSUAL NESTING SITES OF THE AMERICAN
MERGANSER (*Merganser americanus*.)

By WALTER RAINE, Toronto.

In all works on North American birds, nests and eggs the nesting situation of this species is given as being in a hole in a tree, after the manner of the hooded merganser, buffle-head, American golden-eye and wood duck. I was therefore very much surprised to find American mergansers nesting in holes under boulders on an island in Lake Winnipegosis, Manitoba, during June, 1903.

My son and I found about 30 pairs nesting on Gun Island on June 16th. All the nests that we could reach were built far back at the end of dark passages under boulders on the highest part of the island, some nests being from four to six feet back from the entrance and were hard to get at; in some cases my boy had to crawl between the boulders to reach the eggs and I had to pull him out by the feet. In one hole he caught a female on the nest, and afterwards my boy tied a fishing line to its leg and let it swim around the boat. It was astonishing with what speed it cut through the water using its wings and fairly flying under water, after which we gave it its liberty and it flew away. The nests contained from 8 to 12 eggs, one nest containing as many as 13. They are easily distinguished from other duck eggs by their very large size and pale buff tint, averaging 2.60×1.80 . One nest contained eggs laid by two females as half the eggs were of a deeper tint and different size and shape than the others. The down is pale greyish-white after the fashion of all other ducks that nest in holes in trees or in the dark. The male mergansers flew away as our sail boat approached the island, but the females sat close dashing past our feet as we scrambled amongst the boulders where they were nesting. On this same island several red-breasted mergansers had nests containing 8 and 9 eggs each; their nests were not at the end of burrows, but in depressions under dense undergrowth. The eggs are smaller than those of the American merganser and of a darker tint, being yellowish-drab or warm drab; average size 2.50×1.70 . The down is also

darker and of a warm greyish tint. Both ducks are very destructive to fish and are therefore disliked by the fishermen. They are known to gunners as sawbills, and their flesh is rank and unpalatable.

ORNITHOLOGICAL NOTES.

During the past season I investigated an unusual nesting site of our common black duck (*Anas obscura*). This well known and extensively distributed species usually builds its nest on the ground, but last June I visited an island in the St. Lawrence where a pair had taken possession of a last year's crow's nest and successfully brought off their brood. The nest, which was built after the usual style of crow architecture, was saddled on a limb of a hugh elm, forty feet from the ground, and was reached after a difficult climb with climbing irons. A liberal supply of down had been furnished by the duck and incubation was well advanced. Just how frequently such nesting sites are resorted to by these ducks it is difficult to say; had the bird not been accidentally observed flying to the tree her presence would never have been suspected. I photographed the nest containing the ten eggs, but owing to the extremely awkward position in which I had to make the exposure only eight are shown. The duck sat very close and did not leave the nest until I was within a few feet of it.

THE BLACK GUILLEMOT (*Cephus grylle*).—June 10th last, while walking along the harbor front, I saw a black guillemot swimming rapidly toward the open lake. I believe this is the first instance of this species having been observed in this locality. Speaking of this bird in 1885 the late Mr. McIlwraith, in "Birds of Ontario," says one was shot in Hamilton Bay many years ago, and according to the Catalogue of Canadian Birds one was taken at Toronto in 1885. These seem to complete our records for Ontario. While at the Magdalen Islands last year I saw many flocks; they are swift flyers and expert divers. Unfortunately, a large percentage of the guillemots that occasionally stray as far west as Lake Ontario die of starvation, so often the common fate of sea birds that wander so far from their natural habitat.

E. BEAUPRÉ.

Kingston, Oct., 1904.

AN OCTOBER TRAMP.

Lured by the glamour of a recent morn, which presaged a bright invigorating day, I started at eight o'clock for a tramp to Kirk's Ferry, where the charming scenery of the Gatineau river and the Laurentian hills is admirably exhibited. This very diversified and picturesque district holds many attractions for the naturalist and nature-lover. Through its broken ridges and swamps, the deer are still not uncommon, especially in the neighbourhood of the beautiful lakes which lie a few miles to the westward (Meach, Harrington and Phillips). From these retreats they sometimes stray, or are driven, even nearer to the city, as it was my good fortune to observe on this tramp. When half way up the long hill (which gives pause to many a cyclist) opposite Wright's Bridge, I heard the yelping of dogs coming up from the deep wooded ravine through which the Old Chelsea brook flows down to the Gatineau. Halting for a moment, I was greatly surprised to see a doe and fawn go bounding by on the other side of the ditch, their white tails flashing among the roadside weeds and brambles. They did not seem to see me, but disturbed by a wagon a few rods ahead they separated, the doe going off toward the river and the fawn turning to the left down through the gullies. The noise made by the dogs upon their trail showed that the pursuers were not hounds, and when they came in view, toiling heavily along, they proved to be a spotted coach-dog and an old collie. They went off upon the trail of the fawn, but I was glad to think that they could hardly overtake even this poor little creature. Surprised to witness a chase within less than five miles of the Parliament Buildings, my wonder was augmented upon gaining the plateau at the top of the next hill (at the pine grove where such a good view offers of the Chelsea rapids) to see another doe coming down through the field, as if to cross the road toward the river. It was running almost straight for a wagon full of hunters from Hull, but startled by their stopping and jumping down to get their guns out of the wagon, it turned and ran down inside the fence toward me. My sympathies being with the harassed and timid animal, I crouched down by the fence, and when it came by at arm's length I jumped up and waved my coat,

to frighten it back into the woods. It ran to the end of the field and then crossed the road and went down over the hill side. Two of the gunners came up and asked me where it had gone but I merely said that it had crossed the road, upon which they went down through the thick scrub some distance from where the deer went in, and having no dogs I knew there was little fear of them finding the quarry. Near Chelsea, in the cone-laden pines, squirrels were feasting upon the seeds, which they deftly extracted from the long cones held upright like tapers before them. The road here winds through a rich piece of woods, offering a welcome shade to the way-farer in midsummer. Unfortunately the axe of the woodman has already made considerable ravages among the maples, beech and oaks. Some ledges of rock, faced with various mosses and lichens and crested with a luxuriant growth of polypody, suggested that a new locality might be found for the dainty walking-fern. My quest extended some distance from the road, but in vain. A large hawk was working among and over the trees beyond and apparently made a kill, as it settled on a limb and evidently tore its prey to pieces. The bird was so hidden by intervening trees that the species could not be made out, but it appeared to be dark above and very pale beneath. The squirrels here were feasting on the fallen beech nuts, and bluejays with brilliant plumage and ugly voices fluttered from place to place. There were numerous juncos and occasional sparrows creeping about among the fallen leaves, but the bluebirds, so abundant a fortnight before had evidently departed. A partridge next flew up from the roadside and sailed off with a noisy whirr of wings, and while I strolled on slowly looking carefully around for any others, I saw standing in a little glade about thirty yards from the roadside a fine large doe, much larger than those previously seen. It was standing broadside to me in full view, the trees being scattered and leafless, and was calmly contemplating me. After looking at it for some minutes I decided to frighten it back into the bush as I knew if the hunters came along and saw it in such an exposed position its health might suffer. Waving my arms did not disturb it and it viewed the waving of a coat with no more sign of alarm. When I started to go nearer through the rustling leaves it soon cocked up its tail and bounded back over the ridge

to temporary safety. Kirk's Ferry was reached without further incident, and the Gatineau was seen to be unusually high. The hills along the river had lost nearly all the bright colours that clothed their sides so brilliantly two weeks before, for winds and rains had left few leaves upon the trees. After dinner I returned by the back road through Old Chelsea, and down past the old iron mines. Several gunners were seen and shots heard in the hills but no game appeared. Three examples of the Canada jay were noted; one near Kirk's Ferry, one on the road to Old Chelsea, and one about a mile nearer town than that hamlet. I can recommend to our naturalists such a twenty-five mile ramble as pleasant, profitable and health-giving.

W. H. H.

BOTANICAL BRANCH.

The first meeting of the Botanical Branch since the early summer was held at the residence of Mr. W. T. Macoun, on the evening of Nov. 4th. The members present were Messrs. Fletcher, John Macoun, Whyte, Clarke, J. M. Macoun, St. Jacques, Edward Cameron, Roy Cameron, Attwood and Campbell. Mr. Willing of Regina and Mr. W. H. Harrington were present as guests.

The subject chosen for discussion by the chairman was "Individuality in Plants," and in order to introduce it he read extracts from an address delivered by Prof. Hugo de Vries at the Convocation of the University of Chicago, Sept. 2nd, 1904. Prof. De Vries holds that new species of plants originate from accidental forms or sports rather than as described by Darwin in his theory of evolution. In his address, Prof. De Vries gives an account of his observations on Lamarck's evening primrose, a close ally of the common evening primrose. He observed that while the type persisted, sports presenting specific characters were frequent, and in the discussion which followed the reading of these extracts Mr. W. T. Macoun mentioned that he had seen some of these new species in New York. Some of the members present thought Prof. De Vries' selection of a plant to observe unfortunate as the *Oenothera biennis* group have very long been

known to exhibit a wide range of variation in individual plants. It was decided to secure further information on this subject and discuss it at a future meeting.

Dr. Fletcher told of the efforts that were being made in Argenteuil Co. to prevent the further encroachment of drifting sand on cultivated lands there, and exhibited branches of Canadian balsam which had thrown out roots when the sand reached them. These roots would not only serve to add to the food supply of the tree but in the event of its being killed young trees would grow from them. *Spiræa salicifolia*, which grows in the depressions among the sand was mentioned by Dr. Fletcher as being an evidence that the "drifting sand" is dry only on the surface.

Mr. W. T. Macoun exhibited specimens of apetalous apple blossoms. About a dozen flowers were received by him, May 26th, in clusters averaging three flowers each. The calyx was very similar to that of ordinary apple blossoms but the petals were abortive, very small and hidden by the sepals. The flowers were evidently all pistillate. There were 15 stigmas on each flower.

BIRD MIGRATION.—With reference to the note on Bird Migration which appears on page 144 of THE OTTAWA NATURALIST for October, I can fully confirm Mr. Wright's observation as to the immense flocks of evidently small birds passing over the city on the morning of 9th Oct. Sleeping in an upper room with my window wide open I was awakened by their notes and listened to them for a long time. While they were passing I heard the clock in the Parliament Buildings strike three. About an hour later I again heard them for some time. My scanty knowledge of bird-notes did not enable me to recognize the species.—W. H. H.

REVIEWS.

CONTRIBUTIONS TO CANADIAN PALÆONTOLOGY, Vol. III.—ON DRYPTOSAURUS INCRASSATUS (Cope), FROM THE EDMONTON SERIES OF THE NORTH-WEST TERRITORY. Part III., July, 1904. By Lawrence M. Lambe.

The continuation of the Reports on vertebrate palæontology of the Geological Survey of Canada is most welcome. Following Part I. by Professor Cope on the mammals of the Cypress Hills Oligocene beds, and Part II. by Professor Osborn and Mr. Lambe, chiefly on the reptiles of the Belly River series, Alberta, comes the interesting memoir of Mr. Lawrence M. Lambe on the large carnivorous Dinosaur of the Upper Cretaceous, Edmonton or Laramie beds. In the meantime Mr. Lambe has received the well earned title of Vertebrate Palæontologist.

The two skulls described here were found many years ago in the Edmonton series of Alberta, and were identified and described by Professor Cope as specifically identical with *Laelaps incrassatus* which had been found in the somewhat older Judith River beds of Montana. Professor Cope published a brief description without figures, and as we knew little of the cranial characters of the Upper Cretaceous Dinosaurs, Mr. Lambe's full description and figures are of very great interest and value.

As restored by him the skull in proportions is remarkably similar to that of the small Tuatera lizard of New Zealand enlarged to a massive and formidable scale, that is, the facial region is less elongated than in the carnivorous Jurassic Dinosaurs, which seem to be closely related if not ancestral to this Upper Cretaceous form. What is lost in length, however, is gained in strength and power, proof that the Upper Cretaceous carnivorous Dinosaurs were thoroughly capable of attacking the huge horned Dinosaurs (the Ceratopsia) of the same period. These particular specimens are of a somewhat smaller and lighter construction in the feet than others which have been found farther south, and there is evidence of considerable specific if not generic variation among these animals in adaptation to the capture of the many different

forms of herbivorous Dinosaurs which existed at the same period. In his description of the jaw Mr. Lambe figures the presplenial. Professor Williston considers that this is simply an anterior expansion of the splenial.

HENRY F. OSBORN.

MONOGRAPHIE DE L'ÎLE D'ANTICOSTI. By Joseph Schmitt. Paris. 1904. pp. 367.

From whatever standpoint it may be considered, Dr. Schmitt's monograph must be considered one of the best works of its kind published anywhere, and nothing approaching it in completeness has ever been published on any part of Canada. Whatever one may think of such a large part of our country as Anticosti being owned by a single individual, one cannot but feel grateful to M. Menier for having made the publication of such a work possible. Paper and type are excellent and scattered through the book are many illustrations, charts and maps which in themselves would serve to give one a very good idea of the physical features of the island. Dr. Schmitt's long residence in Anticosti and the large collections he has made in all branches of natural history, enabled him to discriminate between what were trustworthy and what were doubtful among the published records, and that these were all consulted is evidenced by the very complete bibliography which concludes the volume.

The first part of the monograph is devoted to the geography and history of the island, and the account of its discovery and settlement is given in considerable detail. Under the heading "Météorologie" the climatic conditions are considered, and Dr. Schmitt's conclusions are based on careful and complete observations extending over several years. The sections devoted to palæontology, botany, ornithology and entomology contain lists of all the species known to occur on the island, with localities and collectors' names, and in all branches of natural history notes on distribution and other information is contributed by the author himself.

J. M. M.

NATURE STUDY—No. XIX.

NATURE STUDY AND THE CAMERA.

By FRANK T. SHUTT, M.A.

As we understand the term, popularly, to-day, Nature Study is primarily and essentially the study of the out-of-doors. Therein lies its great fascination and charm. It takes us out into the sunshine and fresh air—and that is wherein it differs from our ordinary scholastic work. Away—body and mind—for the time from bricks and mortar and books and desks to learn what we can of the form and life and habits of plants and animals, to consider the meaning of the rocks and the soil, the clouds and the rain, but what is of far higher value, to realize as we have never done before the beauty of form, of motion and of color in the things about us—that, in part, is the essence of Nature Study and what it helps us to do. Forest and field, river and stream, the earth and the sky, all may be made to contribute towards this knowledge and all looked at aright may help us in the recognition of the beautiful and thus add much to the enjoyment of life. Our eyes and our mind are opened to the beauty of the things about us. There is created or developed within us a new sense—the realization of the beauty that lies in form and color.

Now, it is evident that the first step in Nature Study is to correctly observe. This is by no means such an easy matter as many may suppose. It is a rare art, though a fascinating one. It not only requires time—one might say, leisure—and concentration of thought, but also practice. To a certain degree it is a gift, born in us, *i.e.*, that we differ, naturally, in our ability to see clearly and accurately and take note of the things about us, but like all gifts it must be developed and trained before it can reach its highest attainment. Moreover, it is an art that can be acquired even by those who by nature are in a large measure unobservant—and we believe that to such, especially, is this study one of great value. How many of us go through life without making a clear mental concept even of the trees and plants passed and repassed almost every day, so much so, indeed, that some have never recorded (mentally) the difference in contour between an elm and a maple!

But Nature Study does not stop at careful observation and the formation of distinct and true mental pictures. It leads to a knowledge not only of the structure but of the functions of living things. It continually puts the questions, why? and wherefore? and thus educates or draws out that valuable art of deduction, without which our observations would be of little service—without which half the value of Nature Study would be lost. Of this feature, however, it is not our present intention to speak further, but rather to bring to the notice of the earnest and enthusiastic student the camera as an aid and adjunct to careful, accurate observation. The making of a photograph—and by the making I include the taking, the dark room work and the printing—serves to impress the image of what we have seen upon the mind and memory as nothing but making a drawing can—emphatically and accurately. The mere focussing on the ground glass of the tree, a clump of fern, the bird on her nest, serves to imprint the image on the memory more accurately, vividly and permanently than does the casual glance at the objects themselves. How much deeper and more lasting is the image after the finished print is made! The writer found in his college days that it well repaid to write out his lecture notes, even though the manuscript might never be reviewed—and in later days he finds the same principle still holds good with Nature Study and the camera.

All this, valuable as it is, however, does not comprise all the benefits to be derived from the aid of the camera. Though Nature Study is, as we have said, primarily for the out-of-doors, it frequently calls for subsequent work indoors to a more complete understanding of the objects of our study. In the photograph, carefully made, we have a record for this purpose. We cannot bring home with us the clump of towering trees, but in the image so accurately made by light we can again and again consider and compare their mode of growth, their contour and many other features. The same truth is still more obvious in geological studies. The rock cuttings showing the various strata, the escarpments and boulders can only be brought home for future study by the camera. And what shall we say of the fugitive clouds that, unconsciously to most of us, make the beauty of the landscape? We must secure the image ere the substance goes,

and that quickly or we shall be without an aid to our imagination for enjoying again the pleasures of the cloud-flecked sky. And as the highest enjoyment is only obtainable when accompanied by knowledge, we may add there is much to be learned from cloud formation and cloud forms, from the utilitarian as well as from the æsthetic standpoint.

Again, we can live again and enjoy the pleasures of our summer studies and rambles in our photographic records, and thus obliterate in part the severity and the monotony of our long winter. Not that the study of nature must necessarily cease in that cold and snowy season. There are a thousand objects still to interest and instruct us in the forest and by the stream, even when the white mantle lies deep upon the ground. One could easily enlarge upon this phase of Nature Study—one that has as yet received but little attention.

All knowledge is relative, or practically so. We learn by making comparisons. What more necessary for this than the possession of records? Of some objects, by their very nature, we can only obtain their image and for this photography is particularly helpful—indeed indispensable. That this fact is now widely recognized we have only to note the wealth of photographic illustrations in all works now published on the Natural sciences.

But perhaps enough has now been said to awaken an interest in the erstwhile photographer, who years ago may have bought a kodak, pushed the button and let somebody else do the rest. That camera, perhaps, was long ago relegated to the garret. Unfortunately, the cheapness of the instrument and the ease with which a part of the picture making could be done has served, with many, to make the camera little better than a toy and its manipulation the merest pastime. Naturally with them the camera has gone the way of the crokinole board and table tennis—it was amusing for a time, but soon became tiresome and was put aside. No, the camera must be used seriously, if it is to be with us a life work and a life pleasure, and it is very much to be doubted if any subject or study can afford so much of interest and value and pleasure as the study of Nature in her manifold manifestations.

And, in conclusion, it may be useful to give a word or two of

practical advice to those who having some skill in photography may desire to use that skill in the study of Nature. To be successful, both from the standpoint of making records by the camera and of making real progress in our study, do not attempt at first to work in many fields. Select one or two subjects, and, as far as possible, exhaust them before taking up another. An odd fact or picture gained here and there from many subjects, may in time make a collection of some interest and occasional value, but not to be compared in either interest or value to a systematized knowledge and a complete record of one or two subjects. Concentrate, then; diffuse work seldom leads to mastery, to satisfaction or success. Choose a subject and as far as opportunity permits study it seriously, in general and in particular, before beginning the exploitation of another, is the advice of one who has had some experience following this method. For instance, let us take the deciduous trees in our neighborhood. For contour, they should be photographed in full foliage and after the leaves have fallen, isolated and growing under forest conditions. Making negatives from the same point of view in summer and winter is most useful. Then make a study of the barks of the same trees. Follow this by a study and the making of careful photographic records of their flowers and seed vessels—an interesting work and one that will put us in possession of a wealth of most fascinating pictures to be treasured alike for their beauty and educational value. Finally, take the leaves, either singly or on a small branch; study and memorize their shapes and peculiarities and make photographic records of them. In this alone there is two or three season's work, even though but half a dozen trees be studied. It will not only afford much interesting and recreative in-door and out-of-door work, but will give us such a knowledge of our trees as few to-day possess. And the probabilities are that we shall also have many beautiful photographs that will delight and instruct us and our friends.

Subjects might be mentioned without number, but they will occur to every earnest worker. Our object was to indicate how the camera may be made of valuable assistance in the study of Nature, and in this we trust we have been in a measure successful. Photographic work and Nature Study are mutually helpful—they progress together—and the writer can honestly affirm that the pleasures and usefulness of both the art and the science are enhanced by their happy combination.

Experimental Farm, Ottawa, Nov. 15, 1904.

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CONTENTS.

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THE OTTAWA NATURALIST.

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OTTAWA, JANUARY, 1905.

No. 10

A LANDSLIDE ON THE LIEVRE RIVER.

By ALFRED ERNEST BARLOW.

(Published by permission of the Acting-Director of the Geological Survey of Canada.)

The people of the city of Ottawa and surrounding country were shocked and alarmed by reading in the early morning paper of Monday, October 12th, 1903, that a landslide of very large proportions had occurred in the vicinity of Poupore Post Office on the Lièvre river, nearly twelve miles north of the town of Buckingham in the Province of Quebec. Many of the details of this catastrophe, as gleaned from the newspaper reports, are no doubt well remembered by most of those who will read this article, which is written in order to describe with greater technicality than is usual in a newspaper contribution, some of the more salient features, furnishing what are considered the main reasons determining and even favoring this wholesale movement of mother earth. The accompanying reproductions, from actual photographs will serve, in a measure, to illustrate the general appearance, two days after the land-slide occurred, of the portion affected. An inspection of these will, it is believed, convey a much more adequate idea than is possible by mere words of the great havoc and ruin wrought to what had previously been the scene of peaceful and happy homesteads, whose inmates harbored no suspicion of disaster. The first intelligence reaching Ottawa that such a calamity had overtaken this peaceful community, in the grey dawn of that Sunday morning, was conveyed in a telephone message sent to Dr. Henry M. Ami, by the Rev. William Patterson of Buckingham. This news was received about 10 o'clock, five hours after the movement

had ceased. All the first reports were, of course, of a rather vague and contradictory character, but ignorance of the details of the situation did not prevent the spreading of greatly exaggerated statements, not only in regard to the extent of the damage inflicted, but also as to the consequences that were sure to follow. It was greatly feared, and firmly believed by many, that the release of the dammed-up waters threatened the safety not only of all the residents in the Lièvre valley below the slide, but also of the town of Buckingham. The urgent necessity for more accurate and detailed information was fully appreciated by Dr. Whiteaves, who, in Dr. Bell's absence, was acting as Director of the Geological Survey. Dr. R. W. Ells, who had previously examined and reported upon the geology of the district in which the slide had occurred, was given charge of the examination, while Mr. LeRoy and the writer accompanied him, to make any necessary surveys and secure such photographs as would fully illustrate the occurrence. The Summary Report of the Geological Survey Department for 1903 contained Dr. Ells' official account of the landslide, accompanied by a small plan showing the position and extent of the area affected. This map, on a scale of twelve chains to one inch, was prepared by Joseph Keele from surveys made by James White, O. E. LeRoy and the writer.

Like the proverbial policeman, the Government geologists were early on the scene after the catastrophe, leaving Ottawa by the evening train of Monday, October 12th, for Buckingham. During the journey, all sorts of rumors were afloat as to the danger threatening the mills, and even the town of Buckingham itself, by the backing-up of the waters caused by the filling up of the channel of the river by the debris from the landslide. On our arrival at Buckingham, however, we were reassured by the report that the water had surmounted these clay barriers, about four o'clock that afternoon, and was flowing over this uneven surface of accumulated material, by a series of small channels, which would certainly deepen during the night. We, therefore, retired to rest at the hotel, with a sense of tolerable security, feeling that the crisis had passed. The morning broke bright and clear and we made an early start for the scene, driving up the road on the west side of

the river as far as Brazeau's house. Leaving our horses there, we immediately began our examination, walking around and across the whole area, taking such photographs as would illustrate fully the phenomena witnessed and making such surveys as were necessary to show the position and extent of the area affected.

This remarkable and extensive landslide occurred on the southwest bank of the Lièvre River, in the early morning of Sunday, October 11th, 1903. The first disturbance was felt at 4.45, while it was yet dusk, and with the exception of some minor disturbances, the whole movement was completed by 5 o'clock. It was not attended by any noise, except that produced by the straining and cracking of the timbers of the various barns and structures affected. The simultaneous transportation of such a large amount of material into the bed of the stream at once completely choked it up, forcing the water to either side, thus flooding the banks, the water reaching to the lower windows of the farm houses. (Plate III.) In all, about 100 acres were affected by the movement, and the larger portions of three farms were rendered practically useless, at least for some time to come. Time will efface many of the inequalities, but the area will never present the same beautiful, sloping farm-land which was looked upon as one of the most desirable agricultural sites in the whole of the Lièvre valley. The excavation caused by the landslide, for most of it is from 25 to 30 feet below the original level, comprises portions of lots 25 and 26, con. XI, of the township of Buckingham, and lots 7 and 8, con. I, of the township of Portland East. The farms which suffered belonged to Alexandre Clément, Maurice Brazeau and Duncan McMillan. Only one residence, that belonging to Clément, was moved. This house, originally situated about 100 feet south of the road which here formed the boundary between the two townships (Buckingham and Portland East), and thus within the former township, was moved about 100 feet north of the road into the township of Portland East, while, at the same time, the area of land, immediately surrounding the house, was lowered *en bloc* about 20 feet. The disturbed area has a somewhat irregular outline, extending back a distance of about 700 yards from the river to the base of the hills of gneiss and granite, which here form the southeastern edge of

the valley. (Plate V, Fig. 1.) Along the river front, the length of the landslide was nearly 600 yards, but near its eastern end a small wooded knoll rises above the general level to a height of about 35 feet, which must be either underlain by rock or made up of a very homogeneous and impervious clay. This small hill, forming a rudely triangular buttress, with the apex towards the land and a base measuring about 100 yards along the river, remained unaffected by the movement. The slide thus divided into two parts, by far the larger amount of material reaching the river to the west of the small hill already mentioned. The greatest excavation is as usual along the base of the hill and at the western or upper end of the slip, while the crevasse, marking the eastern limit, has been concealed, to a large extent, by the piling-up of material into a series of hills, rising from 12 to 30 feet above the clay plain, and made up of loose material derived from the rest of the area. This crevasse, which originally marked the eastern limit of the slip, ran with a gentle curve immediately to the west of Brazeau's residence, the movement overturning his barns and some out-houses, although the residence, carpenter-shop and milk-house were not affected in the general commotion. There were likewise no cross fractures produced in the area on which the house stood, for the water in the well, which is about 12 feet deep, showed no signs of any disturbance. The western limit passed close to the east of Duncan McMillan's house and outbuildings, some of the latter being on the verge of the crack thus produced, while the southeastern edge reached to the slope of the hills of gneiss and granite which here mark the limits of the valley. The Government dam, which was completed some years ago, was pushed about 100 yards from its original position and now points up instead of across the stream; while the locks, constructed at great expense, were filled almost completely with the debris from the slide. A barn, full of hay, situated near the middle of lot 7, con. 1 of Portland was carried down the stream, on a huge block of clay, and now occupies an island in the river, nearly half a mile from its original location. Happily not a single life was lost, though, in the circumstances, it seems miraculous that all escaped. About ten head of cattle were killed and some of these were completely entombed by the overturned clay. Only one man was an

eye witness of the whole of the scene, and at the time of our visit it was believed that his mind was permanently unbalanced by what he saw. Alexandre Clément, standing on the threshold of his front door, saw the slow and deliberate differential movement of the huge blocks of land, which tilted his barns, smashing many of the timbers and boards in the commotion. (Plate V, Fig. 2.) On the opposite side of a large crevasse, which he saw open slowly almost at his feet, a huge block of land appeared to rise to a height of perhaps twenty or more feet. Subsequent examination shows this to have been an optical illusion, for in reality, this land which appeared to rise, remained practically stationary, while, on the other hand, the portion on which his house rested, slowly sank from 20 to 30 feet below its original level. In addition, the whole farm and adjoining district seemed to him to be slowly, but surely, moving towards the river and, after what appeared an eternity, the whole commotion subsided. So gradual and uniform was the motion in the vicinity of Clément's house, that a glass of water, which was filled and standing on the ledge of the front window, was still in the same condition, when the landslide was complete. The water in the well, which was about 12 feet deep also remained at its normal level, showing that no crack was formed in this part of the block of land.

Such landslides are by no means of infrequent occurrence along the banks of rivers which flow through similar clay flats, but, for the most part, only small areas, in the more immediate vicinity of the river, are affected. Several landslides have, however, occurred, within the last sixty-five years, along some of the tributaries of the St. Lawrence river, which were of such magnitude, and attended with such direful results, as to warrant special examinations being made, with a view not only of determining the extent and nature of the damage inflicted, but also, if possible, to reach a definite conclusion as to the causes which bring about such wholesale and profound disturbance of areas, hitherto considered more than ordinarily secure and solid.

The first landslide in the Province of Quebec of which we have any record occurred on the Maskinongé river in 1840,

and was described, in some detail, by Sir William Logan.* The point at which the landslip occurred is nine miles from the granite hills, and where the river is 10—20 yards wide and changes its direction from south to west for 700 yards. The movement commenced about 8 o'clock on the morning of the 4th April, 1840, when the snow was still on the ground. The marly clay first detached was about 200 yards in breadth, and 700 yards in length; it was followed at intervals of a few minutes by four other movements. The whole of the area thus affected amounted to about 84 acres, and the total length was 1,300 yards. The breadth varied, the narrowest part being nearest to the river and the widest, equalling 600 yards, a considerable way from it. The moving mass first crossed the stream and then splitting against the opposite bank, where it averaged a thickness of 75 feet, one-half turned up the valley for about three-quarters of a mile and the other half down it for an equal distance, forming a dam half a league in extent. The whole operation was completed in about three hours. No lives were lost, but two farms were destroyed, while cattle and other live stock perished with the falling buildings.

The St Albans landslip, described by Mgr. Laflamme† of Laval University, occurred on the 27th of April, 1894, on the west bank of the Ste. Anne de la Pérade, about four miles above the village of St. Albans, or seven miles distant from the Rivière Blanche. Here the surface deposits, made up of Leda clay and Saxicava sand, slid down into the valley of the river for the space of three miles and a half. The landslip was in three parts, the first movement being at the northern end where it was about ten feet deep. This was followed after some hours by another which took place immediately to the south and finally a third descended just below the second, leaving a pit 175 feet deep. The average depth of the whole chasm was not less than 100 feet below the general surface of the ground and its width about a mile. The mass of material thrown into the valley of the Ste. Anne permanently changed the course of the river. The Rivière Blanche

* Proc. Geol. Soc. Lon., Vol. III, 1838-1842, pp. 767-769.

† Trans. Roy. Soc. Can., Vol. XII., 1894, Sect. IV., pp. 63-70.

landslip described by Dr. Chalmers was closely similar to that of the Maskinongé river described by Logan. It took place on the east bank of the Blanche, a tributary of the Ste. Anne de la Pérade at St. Thuribe, about 3 miles north of St. Casimir village. The chasm remaining from this landslip is also irregularly oblong in shape, like that of the Maskinongé valley with the narrowest end towards the Rivière Blanche. At this point the breaking down of the beds began and through this opening the whole of the material of the landslip was discharged. The length of the pit, east and west, is about 1,050 yards; extreme width 600 yards; maximum depth about 28 feet; total area 86 acres. The descent of the bottom throughout its whole length is approximately about 27 feet or about 10 inches to the hundred feet, and the gradient is comparatively uniform from the eastern end to the present bottom of the river. Indications of a movement of the clays was first seen on the evening of the 6th of May, 1898, in a small hollow in the bank, down which a trickling stream ran; but no attention was paid to it. About 5 o'clock on the morning of the 7th, the breaking away of the clay beds began where some slipping had been noticed on the previous evening. The softer material flowed out from beneath, while the upper and more coherent clay split off in vertical sheets and columns which were borne away in the sliding, surging mass. This continued for upwards of three hours, when the transporting power seemed to have spent itself, and the great masses of clay, which had become detached from the walls of the chasm, were stranded in its bottom and at the time of examination were seen standing in various positions, some of them resembling cones, pyramids, etc.†

The causes operating in the production of all these landslips may be summarized under two general headings :—

1. The presence of silty, sandy, or gravelly portions or layers in these stratified clays, renders these and some of the adjacent portions capable of absorbing and retaining a large amount of water. According to Mr. R. A. Johnston, of the Geological Survey, who made an analysis of the clays obtained from the

†Ann. Rep. Geol. Surv. Can., Vol. XI., 1898. Part J, pp. 55-69.

Rivière Blanche landslip, they contained, when saturated, from 22 to 25 per cent. of their own weight of water.

2. Increased or unusual precipitation, which furnishes the great excess of water necessary to produce that condition of supersaturation of certain portions of the clay which eventually brings about unstable equilibrium of the beds. Thus, certain layers or portions of the clay are in a semi-liquid condition, and examination of the Lièvre occurrence shows a considerable portion of the clay to have about the same consistency as ordinary thin porridge. The extra weight of the overlying material, due to the unusually large amount of contained water, results in the displacement of those portions or blocks of land which are underlaid by the supersaturated or liquid clay. Movement once begun gathers force and quickly extends the area affected, and the existence of even a very gentle gradient imparts an irresistible movement towards the lower ground in the vicinity of the river.

The flats which border the Lièvre river in the neighborhood of the recent landslip are principally made up of very thick and uniform beds of a stiff, impervious bluish-gray clay, with small and subordinate layers of silty, sandy or gravelly material. This drift material forms a plain, which, with very occasional minor depressions, occupied by small marshes or creeks, extends to the base of the rocky hills. Between this clay and the solid rock beneath, along the base of the hills, there generally intervenes a considerable layer composed of boulders or coarse gravel. Most of the surface drainage from the rocky hills flows out along the top of this plain, reaching the river through one or two small brooks. A large proportion, however, of this surface water flows downward through the coarse gravel and boulders, finding its way into the various sandy or silty layers and thus feeding the wells which are located on one or other of these layers. The introduction of this water serves to produce the necessary degree of saturation. During extreme wet seasons, like the summer of 1903, the amount of water thus flowing into and along these permeable layers must be very large, and with long continued and unusual precipitation the saturated clay is being constantly increased, until the limit is reached and the necessary conditions of unstable equilibrium are produced. As a result it occasionally

happens that the stiff and more coherent masses of clay are broken down and mix with the softer material, the whole mass of clay, sand and mud being tumultuously and irresistibly moved forward and downward into the basin of the river.

According to Mr. R. F. Stupart, Director of the Meteorological Office, Toronto, (see accompanying table,) the average rainfall at Ottawa for the five months commencing June and ending in October, for the past nineteen years, was 14.62 inches. The rainfall during the summer of 1903 for a similar period was 19.44 inches. This abnormal precipitation doubtless contributed in no small measure to the catastrophe.

Sir William Logan, commenting on the cause of the Maskinongé landslide, was of the opinion that it was induced by "pressure on an inclined plane assisted by water;" and though he was not able to determine the nature of the subsoil, he believed, from a survey of the surrounding country, that it consists of Silurian limestone, the dip of which is, where visible, in the direction of the river.

At no point, so far as our examinations extended, did the Lièvre landslide reach the underlying solid rock surface, the gliding plane being in every case composed of the underlying impervious clay or hard-pan. This very smooth and striated surface, as shown in the accompanying illustration (Plate IV), was visible at several points along the base of the hills, as also on the western side of the wooded knolls situated near the river and which were not affected by the movement.

The motion must have been primarily determined by the presence of rather contiguous and extensive sheets of the super-saturated or semi-liquid clay; for it is obvious that no very steep gradient existed throughout the entire distance. In fact, the observations made seemed to warrant the belief, that the gliding plane was only steep in very close proximity to the rocky hills, while a short distance away, it was more or less undulating with only a gentle pitch outwards and downwards to the river. The original level of the plain, at this point, averages about 25 feet above the river, while the river itself is only about 20 feet in depth. Much of the debris which eventually reached the river was material once situated about 20 feet below the original

surface and it was the sudden removal of this underlying material which produced the caving-in of the surface layers, at the same time moving them a considerable distance forward. Most of the trees, except in the vicinity of certain cracks, remained in their original upright position. The motion was spasmodic or halting, owing, doubtless, to the obstruction on the part of the harder and more impervious portions of the clay, so that a number of anticlinal and synclinal folds were produced, while much of the disturbed material showed very excellent samples of block faulting. In many places, owing to this retardation in movement, huge blocks of the hard and impervious clay were shoved up almost on edge through the overlying loam or soil at the surface.

As an immediate result of this landslide, the water of the Lièvre river below was so filled with the finely divided clay as to render it unsuitable for drinking or even for washing purposes. To such an extent indeed was the material held in suspension that even at Montreal, over 100 miles from the scene, the water was quite thick and turbid. The mills at Buckingham were obliged to close down for a considerable length of time as the dirty water clogged the machinery. All the water required for cooking or drinking was obtained from the few wells remaining in the town, that derived from the waterworks being unfit for use.

TABLE showing Rain and Snow Fall at Ottawa during years 1897 to 1903, inclusive.

Compiled under the direction of R. F. Stupart, Meteorological Office, Toronto.

	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total for Year.
		in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
RAIN.	1897	0.38	0.35	1.51	1.62	3.31	3.03	5.21	3.40	0.45	0.69	2.19	1.84	23.98
	1898	0.66	0.90	2.13	0.55	2.46	2.24	2.87	3.22	3.48	5.68	0.36	0.41	24.96
	1899	0.75	0.29	1.09	1.03	5.50	2.37	7.62	0.44	4.93	2.47	1.74	2.24	30.47
	1900	0.20	1.20	0.20	0.76	3.00	3.21	5.99	2.72	3.56	1.45	2.40	R	24.69
	1901	0.20	0.00	0.90	2.99	3.91	3.76	3.18	3.23	1.91	1.45	0.40	2.13	24.06
	1902	0.81	0.40	3.14	2.74	1.82	4.29	5.98	1.67	1.23	3.30	1.26	0.80	27.44
	1903	0.96	1.60	1.32	0.85	0.12	6.55	3.24	4.00	2.14	3.51	0.39	R	24.68
SNOW.	1897	15.5	15.7	28.6	2.0	.....	.....	.....	.....	.....	.....	5.8	22.9	90.5
	1898	26.4	34.3	*	2.0	.....	.....	.....	.....	.....	.....	10.7	27.2	100.6
	1899	14.1	5.8	45.9	*	.....	.....	.....	.....	.....	.....	*	10.0	75.8
	1900	25.4	14.0	35.0	(10 in. snow = 1 in. water)							11.0	16.0	101.4
	1901	31.1	8.0	13.0	*	.....	.....	.....	.....	.....	*	18.5	21.9	92.5
	1902	30.9	24.3	3.3	.....	.....	.....	.....	.....	.....	.....	2.0	24.5	85.0
	1903	18.6	26.5	0.3	1.0	.....	.....	.....	.....	.....	R	3.0	18.8	68.2

AVERAGE PRECIPITATION FOR 19 YEARS.

RAIN AND SNOW.	3.00	2.62	2.89	1.86	2.74	2.95	3.46	3.04	2.66	2.51	2.53	2.96	
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R represents only traces of rain.

* " " snow.

REVIEW.

THE NATURE STUDY REVIEW. Published at 525 West 120th St., New York City, U.S.A. Bi-monthly. Subscription \$1 per annum.

"Devoted to all phases of Nature Study in elementary schools," is the comprehensive sub-title of this new periodical, the first number of which has just been issued. In the introduction the editors say that their "plans are based upon an interpretation of Nature Study in its literal and widest sense as including all phases, physical as well as biological, of studies of natural objects and processes in elementary schools." This interpretation of Nature Study includes all the "natural science" studies of the lower grades in the public schools, and it is with Nature Study in relation to elementary school work that THE REVIEW will chiefly deal.

The Nature Study articles published in THE OTTAWA NATURALIST cover much the same field, but important features of THE NATURE STUDY REVIEW are its Book Reviews, Notes on Recent Literature, and Guide to Periodical Literature. These departments will keep both student and teacher posted as to the literature of a subject in which they must perforce interest themselves. The chief Articles in the January number are "Nature Study and Natural Science—a Symposium," "Physical Nature Study," "Nature Study and Elementary Agriculture in Canada," "Some recent criticisms of Nature Study," "Agriculture in Southern Schools," "School Gardens," and "Ant Nests in the School-room." These titles indicate the scope of THE REVIEW, sample copies of which may be obtained by sending six cents in stamps to the publishers.

The Club's soirée season opened Dec. 16th, when Mr. Andrew Halkett lectured on "Animal Life in the Hudson Bay Region." Jan. 17th, Prof. Prince, Mr. A. P. Low and Mr. J. M. Macoun talked to the members of the Club on Mammals. Reports of these meetings will be published in the next number of THE NATURALIST.

NATURE STUDY—No. XX.

NATURE STUDY AT THE MACDONALD INSTITUTE.

By D. J. DOYLE, Guelph, Ont.

Perhaps no more important educational problem has been attempted in recent years than that which was presented in the Nature Study department of the Macdonald Institute at Guelph to the late Dr. W. H. Muldrew, whose unexpected death on Oct. 7th, 1904, at the very beginning of the first term in which a regular Nature Study class had been enrolled, has proved a serious loss not only to the Macdonald Institute, but to educational progress generally in Canada. Prof. Lochhead, who next assumed charge of the Nature Study department, setting to work with a definite aim, has ably carried forward the work of his predecessor.

Regarding the psychological value of the new study in the development of child intellect, there is, I think, a general measure of unanimity among educational workers. It is when we turn from this phase of the question to the necessity of the teacher's knowledge of Nature and the simpler elements of Science extending far beyond that of the child, in order that the efforts of the latter may be best stimulated and directed, that the first note of discord arises; and we find our educators quietly taking sides. On the one hand are arrayed those who assert that a knowledge of child-nature is by all odds the primary requisite for the equipment of the teacher of Nature Study. On the other—and here are embattled the staff of the Macdonald Institute—stand those who believe that a knowledge of child-nature, while an element of very great importance in itself, must still yield precedence to a knowledge of that other nature which is to be met with in the out-of-doors, and upon the regular working of whose laws the welfare of the human race inevitably depends.

Imbued with this conviction, the staff early directed their efforts towards placing the students as much as possible in direct contact with Nature, and particularly with those objects and phenomena which lay readiest to hand. This was secured in two ways, (1) by field excursions, (2) by laboratory work and lectures. The field work proved in many ways perhaps the most in-

structive feature of the work at the Institute. Here for the first time were the students placed face to face with Nature. To the keen observer how much do the field and wood reveal on an autumn day? How seriously is he handicapped whose knowledge, brought to the interpretation of Nature, has been limited to the casual observances of a few leisure hours! The distant gleam of white on the alder bough, the flitting glimpse of a grey wing in the bush, the patch of green on the old beech trunk pass unheeded by under the eye of the nature amateur. But when under the direction of a skilful naturalist, the white upon the alder has been examined and reveals itself as a mass of fuzzy living aphids; when the peculiar squeaky bird-call has been sounded and the grey wing resolves into a nervous, shy, little ruby-crowned kinglet; when the patch of grey on the beech has revealed one of the many lichens, and one's laboratory practice tells him that this little mass of grey represents a life far down in the scale of plant development, then the fields and woods take on an added interest, and the simple and obscure claim equal rank with the gaudy and the beautiful.

The best methods of correlating the new Nature work with the old subjects on the curriculum was a matter demanding particular attention. For an illustration of recent earth history it was shown that no better spot could be selected than a gravel pit. Here the pupils may examine the shape and nature of the gravel-stones, the resemblances or differences between these stones and the bed rock, the arrangement of the layers of gravel, the dip of these layers, etc., showing the action of water. Subsequent lessons may include observations of the surrounding country, evidence of the action of ice or water, changes in the beds of lakes and rivers, etc., from which the pupils may deduce much of the past history of the locality. In history, a beginning may be made in the life of the district, its trustees, its forms of government, the township council, leading men and women of the township, stories of early settlement, etc. In literature certainly, a knowledge of nature is necessary for an understanding of the passages to be studied. Let the pupils go out to the meadows and observe the bobolink there before taking up such a selection as Bryant's "Robert of Lincoln." Only in this way can they appreciate the

truth and structural adaptability of this little poem. In composition, descriptions of journeys in the fields and woods, of birds and trees and animals observed, may be found subjects on which the children will write interestingly and naturally. Taken altogether, Nature Study need not be considered a new subject, but rather as a vitalizer of the old.

Here also may properly be mentioned the lectures and field work in gardening conducted by Prof. Hutt, of the College staff. During a spring or summer term this work should be made to constitute one of the most important features of the course. But the nature of the weather this fall seriously interfered with the carrying out of any extensive field work. What was possible, however, was done. Following a series of lectures on the subject, advantage was taken of the first fine day to stake off, level, plant, and label a series of plots, each student having one in charge. The lateness of the season prevented the germination of the seeds, but this work was carried on within doors by means of germinating boxes and blotting pads, a series of drawings being made to illustrate the stages of development in the plants.

Roughly speaking, the work in the laboratory was divided into three parts: (1) an examination into the stages of plant evolution as revealed by the common algæ, fungi, lichens, mosses, ferns, etc., of the locality; (2) experiment in plant physiology, elementary physics, and organic chemistry; and (3) elementary entomology.

If to any subject, surely the old adage that "seeing is believing" is applicable to Nature Study. Here, if never before, the child must get rid of books and hearsay, and reach down to the very facts of Nature itself. The pictured object which some one else has seen and depicted, will not suffice here; much less the word description. The child must come in contact with the actual object and develop through his experiences with that. And yet, how much of the teaching of the past has practically been hearsay, those who have passed through our elementary and high schools within comparatively recent years can sadly testify.

It was Plato, I believe, who instanced the position of a man who had grown to maturity in some dark place and then been brought suddenly forth to the light of day and the world of nature around him. He pictures the wonder of that man, his *realisation* of the facts before him. He has not seen these things pictured in books and grown up with them. To him they are new, and real, and divine. In a somewhat similar position is the child who has grown up in personal contact with Nature. How does the crude sap in the soil rise in the stems of plants? The child knows it does rise, for he has seen the watery juice in the stems and leaves.

But how? Two simple laboratory experiments reveal the facts: (1) that given certain conditions, liquid will rise in a glass tube through an osmotic membrane, which may represent a root fibre, and (2) that colored liquid will rise in a cut stem placed with its end in the liquid, and further that, in rising, it follows certain, well defined passages. The child sees this before his eyes. It has become a real fact in his consciousness. He has had a new experience. And these are only a few of the many simple experiments by which a realization of the working of Nature may be brought home first hand to the pupil.

With younger pupils, no doubt these broad and pleasant stimuli which appeal to the æsthetic side of the child's nature must be largely depended upon for development of sense activity. But to the child whose years at school are limited, a practical knowledge of those features of Nature with which his life-work will be most closely connected is of many times the value. With this object in view, the attention of the class was directed towards the collection and study of weeds and weed seeds, and the rusts, smuts, and other parasitic growths which at times have proved so serious a menace to agricultural success. To this work were appended brief descriptions of the best methods of fighting these enemies of the farmer. The collection of specimens of injurious insects and their work, also placed the class in possession of much valuable information regarding another element of danger to the farmer's crop.

In the Manual Training department a successful attempt has been made at the correlation of Nature Study and woodwork, cardboard work, drawing, design, color work, and modelling. In the wood and cardboard work only such models have been selected as would prove of practical value in the Nature work, as, plant labels and garden stakes, spreading-boards, terraria, bird-houses, etc., in wood, and seed-boxes, etc., in cardboard. In drawing, no pencils were used, brushes taking their place. A beginning was made in blob work and moss drawing in ink. This was followed by color work, the construction of charts, drawing of objects in colors, and natural and conventional designing. Of this work perhaps the most important feature was the drawing of natural objects in colors. Anything—a bird, a butterfly, a twig—was selected and worked out with a brush in its natural colors. Prof. Evans, who has charge of the Manual Training department, advises the introduction of this work into even the lowest grades and its continuance throughout the School. In this way it is hoped we may be able to cut adrift from the conventional, expressionless drawing work of the past, and do something towards the development of those artistic instincts which have hitherto been left dormant in the child. Poets may be born, but artists must be developed.



View looking down (east) Lièvre river from McMillan's house, showing submerged portion of the flat caused by the damming up of the river by the material from the landslide.



The gliding plane of clay striated by the gravel contained in the bottom of the moving mass of supersaturated clay.

FEBRUARY, 1905.

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CONTENTS.

	PAGE
1. Canine Intelligence, by Sir James Grant.....	197
2. Meeting of the Entomological Branch.....	199
3. Botanical Branch.....	202
4. Nature Study—No. 21.....	209

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No. 11

CANINE INTELLIGENCE.

By SIR JAMES GRANT.

THE JUDGE AND THE DOG.

What a peculiar animal the dog is! How full of instinct, in fact almost approaching common sense, or uncommon sense, if it might so be termed. There is so much in the very expression of his face, the cock of his ear, the grin of his mouth, the wag of his tail and the occasional oblique attitude of his body, all making up in a most unmistakable way, for the absence of speech, so often uttered by a bark. Is it any wonder the dog takes so important a place in almost every household? He is far more than ornamental, he is useful, and his characteristics, studied out, even in a moderate way, demonstrate beyond a doubt, how much there is in this type of the quadruped species. Now and then in this section of Canada we have a real dog show, and for variety and peculiarities of dogs, the wonder is, how so many strange dogs found their way so near the north pole. In the discharge of my professional duties, I have often been amazed at the sense exhibited by dogs, particularly in the way of observing the sick of the household. Recently, a little Scotch terrier, one of the small, well cut and shaggy-haired kind,—the little fellow that looks under his long hairy eyebrows, as if he knew more than any other of his class—attracted my attention. This little canine held his own position in the household with great coolness and dignity. When any stranger called, he generally observed the surroundings in his own peculiar way, and just in accordance with his impressions, he would growl as if not perfectly satisfied, or take a good look and walk off quickly to his usual quarters, fully satisfied

nothing in particular would happen. The proprietor of the house, a judge of high standing, had been ill for some months, during all of which time the little terrier was a great comfort and source of pleasure. Wherever his master changed his place there also the little dog was to be found. He noted every action, and no matter how many called, or what the company was, behind, or under his seat or on the mat near his feet, the little canine proved beyond a doubt his faithful character, and almost actual knowledge that his master was not in his usual health and spirits. For some time the physician had not paid much attention to the little canine, who apparently was not to be passed over in a casual manner. One day, when making the usual call, the small dog was actually on the sidewalk evidently on the look-out for the particular friend of his master. No sooner had the physician arrived than the dog began his usual gyrations, evidently greatly delighted at the prospect, and followed him to the bedside of his master. There he took his position, first looking at the doctor and then at the sick man, as if quite aware something was wrong. As things moved lively he was on the alert, but when all was quiet and dull he remained much the same. This state of affairs passed on for some weeks, and the certainly instinctive actions of the little terrier could not but be observed. After a long and trying illness the patient passed away. Some days afterwards, the family physician called to pay a friendly visit. The dog was there, but much changed in character. No longer active and energetic as formerly but rather quiet and indifferent, he took his position on a rug near at hand and turned his back on the visitors, evidently not wishing to attract attention, as his chief source of pleasure was gone, and the familiar voice was hushed forever. The actions of these little animals, so strange and peculiar, are evidence of mental power, difficult to define and sufficient to make us cherish their actions, indicative of rare attachments and canine sympathy.

MEETING OF THE ENTOMOLOGICAL BRANCH.

Meeting No. 19, held at Mr. Gibson's rooms on January 19th, 1905; nine present. The chair was taken by Mr. Arthur Gibson, who stated that the proceedings this year would be of the same nature as heretofore, viz., that each member would be called on in turn, and he trusted that all would endeavor to bring something to exhibit, or some note to read at each meeting of the Branch. In the past this plan had proved so successful that he considered it probably the best way of keeping up the interest. Every actually observed fact was of value, however simple and unimportant it might seem to the observer who made it. Accordingly he called upon every one present in turn and a most instructive evening was passed.

Mr. W. Metcalfe showed a collection of about 100 specimens of all orders which had been collected by him when carrying on his own investigations among the small Heteroptera. His material in his own specialty was not yet sufficiently in order to bring before the Branch, and he asked Dr. Fletcher to speak of any of the specimens in the other orders which seemed worthy of mention. Several rare specimens of flies, beetles and sawflies were then exhibited and short statements made concerning each.

Mr. Norman Criddle, one of our members, from Aweme, Man., described the physical nature of that part of Manitoba where he lived and pointed out the exceptionally suitable character of the locality for collecting insects and plants. He also showed an interesting series of Tiger beetles taken on the drifting sand of an extensive tract of sand hills lying south of Douglas on the C. P. R., and about 12 miles east of Aweme. These specimens included the beautiful local variety of *Cicindela formosa*, which has received the varietal name of *Manitoba*, Leng; *C. venusta*, *C. purpurea*, var. *limbalis*, *C. punctulata*, and the two very interesting sand-loving species *C. lepida* and *C. limbata*. These two latter are extremely rare in collections, being found on the sea coast and on similar sandy tracts to the one above mentioned, in Kansas and Nebraska. Other striking insects shown by Mr. Criddle were a curiousrove beetle named *Xenodusa montana*, var. *hirsuta*, which lives in nests of ants; a large and strong ground beetle, *Pasimachus elongatus*,

and a specimen of the Rocky Mountain Locust, *Melanoplus spretus*, which occasionally has done harm in Manitoba and the North-west, but which has not been seen for a year or two.

Mr. C. H. Young showed a most exquisite collection of microlepidoptera (about three hundred specimens) which had been taken during the past summer at Meach Lake, Que., and around Ottawa. All the members present were delighted with the beautiful and neat way in which these specimens were set and labelled. Many of the specimens had been reared by Mr. Young from larvæ, and records kept of their food plants.

Mr. W. J. Wilson submitted an interesting small collection of insects taken on the Hudson Bay slope during the past season. He stated that the season had been an exceptionally poor one for all kinds of insects, except perhaps for mosquitoes.

Mr. Andrew Halkett read some interesting notes made in the Arctic regions as Naturalist of the Neptune Expedition, under Mr. A. P. Low. The large larvæ of the Bot Fly of the Cariboo were shown, and a description was given of the way in which these repulsive creatures occur in the backs of the cariboo. They are oval in shape, over an inch in length and about half an inch in width. The body is covered with short spines, and the creatures must be the cause of great suffering to the animals while they are present beneath the skin. When mature they force their way out through a hole in the skin, in a similar way to the warbles seen on the backs of cattle, and fall to the ground. Later, the mature fly, *Edemogena tarandi*, L., appears. It is a hairy fly three-quarters of an inch in length, of a yellowish colour, bearing a black band across the middle of the thorax, connecting the bases of the wings. The abdomen is yellow at base but has two-thirds at the tip reddish-brown. This insect Mr. Halkett spoke of as the "Tooktoo Fly," which he named from the Esquimaux word for the cariboo. Parasites from the walrus and seal were also shown, as well as some beetles and caddice flies.

Mr. D. A. Campbell showed some eggs, and larvæ in the first stage, of the Cecropia moth, pointing out that the piliferous tubercles were of a different nature in the different stages.

Mr. J. W. Baldwin showed a series of the Meadow Brown butterfly (*Satyrus nephele*), which illustrated the exceeding vari-

ability of markings in this species. A bottle containing living specimens of small ground beetles which he had collected in the autumn and had kept alive through the winter was also exhibited.

Dr. Fletcher showed specimens of two imported cockroaches, *Panchlora viridis*, a beautiful apple-green species, which had been found at several places in Canada during the past season. Specimens had been taken by Mr. C. Stevenson, in Montreal, by Mr. Baldwin in Ottawa, by Miss Dorothy Coates in Winnipeg, and by Mr. J. W. Cockle at Kalso, B.C. The species is a native of the West Indies, and had, probably, in all instances, been imported in bunches of bananas. Another large species found by Mr. C. Stevenson, in Montreal, *Periplaneta australasiæ*, has also lately turned up in numbers in Philadelphia. An extract was read from a letter by Dr. Henry Skinner, just received, in which he quotes from a correspondent, as follows: "I had a lot of living insects sent me yesterday. They are in the greenhouse of one of the members of the Pennsylvania Horticultural Society, and are devouring everything from an orchid to an overcoat." Some remarkable oak galls from California gave an opportunity for speaking of the work of these insects. Specimens of the Brown-tail moth from Massachusetts were shown in all stages of the insect. A single specimen of this moth was taken in St. John, N.B., in 1902, by Mr. W. McIntosh, but no further occurrence in Canada has been reported. It is now causing great concern by its rapid increase in Massachusetts.

Mr. Arthur Gibson showed specimens and spoke on the cosmopolitan occurrence of the granary weevils. The best remedies for preventing injury and destroying the beetles in infested grain were described. The Columbine borer (*Papaipema purpurifascia*) in all stages was shown, and an account given of injury done by the larvæ in beds of columbine at the Experimental Farm. Some well-made inflates of the larvæ of some sphinx moths were also shown by Mr. Gibson and were much admired by all present.

The Chairman drew the attention of the members to the beautiful report by Prof. E. P. Felt, State Entomologist of New York, recently issued on the Mosquitoes or Culicidæ of New York State.

J. F., for Sec.

BOTANICAL BRANCH.

The second meeting of the Botanical Branch was held at the residence of Mr. J. M. Macoun, Thursday evening, Nov. 18th, when the following members were present: Messrs. Fletcher, Attwood, John Macoun, Blackadar, Edward Cameron, Roy Cameron, R. B. Whyte, W. T. Macoun, T. E. Clarke, Carter, St. Jacques, Clarke, Ami and J. M. Macoun.

The discussion on "Individuality in Plants" was resumed and a letter was read from Prof. D. F. MacDougal, of the New York Botanical Garden, in which he stated that certain points connected with mutants and hybrids seem to be well established. These are:

"1. No systematist who has seriously examined the mutants of Lamarck's evening primrose, in the adult stage, has decided them to be otherwise than species and varieties in accordance with the estimate placed upon them by de Vries.

"2. Lamarck's evening primrose does not vary widely, not so widely as some of the mutants, as has been found by statistical methods. The mutants do not intergrade with each other or with the parental form as shown by series of measurements.

"3. The common evening primrose does not vary as widely as it is reputed to do, as has been found by cultural studies: doubtless closely related species have been confused with it, which has led to much misapprehension in the matter.

"4. Mutants have been seen to arise from Lamarck's evening primrose in my own cultures under circumstances that admitted of but one interpretation, and historical investigations show that this species is eligible as research material in every way.

"5. The entire obliteration of the evening primroses and all records concerning them would still leave ample evidence that new qualities arise suddenly or by mutation and that new species owe their origin to changes of this kind. It can not be proven of course that all species arise in this manner, and very probably they do not, as for instance, the species that have been formed by natural hybridizations."

In Prof. MacDougal's paper on "The Origin of Species by Mutation," he cites *Chelidonium laciniatum* as an example of a

species which apparently originated accidentally. He says : " Sprengler, an apothecary in Heidleberg, discovered in his medicinal garden in which *Chelidonium majus* was cultivated a new form of *Chelidonium* with divided leaves and laciniate petals. . . . The new species was found to be self-sustaining and in repeated cultural tests has shown no tendency to revert to *C. majus*."

During the discussion Mr. W. T. Macoun stated that among seeds of *C. laciniatum* received from Upsala and grown at the Experimental Farm, only twenty per cent. had proved to be that species, the remainder being *C. majus*. It is, of course, possible that the seed may have been mixed, but if not, this disposes of *C. laciniatum* as a species. Further tests will be made at the Experimental Farm from their own seed.

One of the members having suggested that the fact that the Early Rose and some other varieties of potatoes no longer ripened seeds was an evidence that these varieties were degenerating, it was brought out in discussion that the reverse was the case. The energy which formerly was required to mature the seed now went to increase the size and number of the tubers. Mr. W. T. Macoun expressed the opinion that if by spraying and watering growing potatoes could be carried past the time when the stalks usually dry up a greatly increased crop would be the result as this would give an opportunity for the small tubers to grow and ripen.

A description of an interesting experiment on the vitality of the common buttercup was given by Dr. Ami, details of which appeared in the December number of THE NATURALIST.

The third of the series of meetings in connection with the Botanical Branch of the Club was held at the residence of Mr. H. M. Ami on the evening of Dec. 6th, 1904. There were present Messrs. John Macoun, W. T. Macoun, R. B. Whyte, A. E. Attwood, D. A. Campbell, T. E. Clarke, H. St. Jacques, and Roy Cameron. Mr. E. Stewart, of the Forestry Branch of the Department of the Interior, and Mr. Hamilton, of the Exhibition Division of the Department of Agriculture, were present as guests.

The topic chosen by the chairman for discussion was "Conifers," and he introduced the subject with a brief paper on "A typical young pine forest growing at Ironsides, near Ottawa,"

where conditions prevail which afford an excellent opportunity for members of the Botanical Branch of the Club to study not only pine-life, but also the growth of trees generally. There are poplars, birches, maple and pine trees, growing together in a young forest which began to sprout after the fire of 1870 which cleared the whole region for miles, and laid bare, owing to erosion of the underlying clay deposits, several thousand acres of land on which not a blade of grass could be seen. The following notes on the forest, which can be seen there at the present time, are herewith given.

"After the big bush-fire of 1870, which swept over a large portion of the Ottawa valley and laid waste large areas of good and bad timber lands, there followed the consequent erosion and denudation of the country. The timber-laden district of Ironsides, between Ottawa and Old Chelsea, had been totally destroyed by fire, leaving on the ground nothing but the bare burnt clay, together with a few large trunks of the gigantic pines of this neighbourhood, which attested to the great destroyer of plant-life and the once thriving forest. Lumber camps had come and gone. Man had cut the best for himself, leaving only the smaller scrub behind, and a few others spared by the axeman.

"Presently, not even the trunks of the trees were seen standing or fallen, throughout the burnt areas, for the erosive agencies soon began their powerful operations, whilst vegetation, which usually acts as a deterrent to the progress of waters from rain in reaching the nearest streams, was no longer there.

"Rain having acted upon the unctuous clay deposits, the fine materials of which it is composed were soon carried down to the lower levels in the nearest brooks, and a clean, bluish-gray clay surface, well-washed and presenting a destitute and barren piece of country followed.

"Not a blade of grass could be seen for miles. This state of affairs continued for a couple of years, during which the waters of the district carved out the strata, and carried off much of the soil and clay of the district. Deep valleys were excavated, trunks of trees, and other remains of vegetation, etc., were carried away and buried in the sediments of this period down the Gatineau or Ottawa.

"Nature is always busy, and as soon as there came a slight lull in the process of denudation, she sent forth her redeeming forces and employed them in restoring, reconstructing and maintaining the equilibrium by sowing seeds of various grasses, shrubs, trees and other kinds of plants from this well-known

prolific district, and soon the blue-gray clay mass and tints began to disappear and assume a green appearance. Denudation and reforestation had a struggle. The former had won outright at the outset, but now it was the birth of a new forest, and it was also the turn of plant-life to flourish and spread its beneficent mantle over the land.

"To-day there may be seen in the same district a dense young forest of soft and hard-wood trees, with the usual associates of the forest in the form of shrubs, flowers and grasses, sedges, mosses, etc. The humblest of these are, perhaps, the greatest protectors to our forests. They keep back the rush of the waters in periods of flood and rainstorm. In the Ironsides district to-day we have a young pine forest which is apparently growing to the best advantage for the production of fine pine timber in the not distant future.

"What are the conditions prevailing? Along with the young pines there may be seen growing in luxuriant form, poplar trees (*P. grandidentata*, *P. tremuloides* and *P. balsamifera*), also birches and maple trees, amongst which we have *Acer rubrum*, whose gorgeous tints of autumn time afford such glorious pictures to the view of the city folk from Parliament Hill. As is well known, poplars grow much faster than pine trees. A visit to the locality will show you a young pine-tree practically surrounded by other trees, chiefly poplar. The poplars are taller than the pines, and are likely to maintain their supremacy for some years to come. As long as the poplar-trees keep growing taller, and in the growing period of the year over-top the pines, we find that the lower branches of the pine-trees will be stifled or become more or less abortive, owing to the density of the foliage surrounding the trunk of the pine-tree. By the time that the poplar-tree reaches its maximum height, the branches of the pine-tree will be mere twigs. This will give the pine-tree a trunk free from knots, and form merchantable timber of the greatest value. The instant the poplar-tree stops growing taller, the pine-tree in turn shoots upward and out from the mass of foliage below, and soon towers above the poplars till it reaches its maximum height—three or four times that of the poplar. Then the life of the poplar begins to decline, the trunk decays, its branches break and fall, whilst insect-life comes in to accelerate its doom. The pine-tree, in the course of a few years, begins to spread an umbrella-like shade over the dying poplar, to hasten the final crisis, which the winds of summer or storm soon bring about. Then the monarch of the Eastern Canadian forest is king, and rules.

"I imagine that there are few places on this continent where a study of pine-life can be carried on to greater advantage than in our immediate vicinity at Ironsides, Que. I had an opportunity

this fall (September, 1904) of visiting Woodstock, Vermont, where Yale students of forestry have an excellent opportunity to study young forests.

"I have no hesitation in saying that it would be most interesting to have yearly records of the life-history of some of the individual trees of the Ironsides district, in order to ascertain the normal as well as the best conditions which must prevail in order to form fine timber trees, whether pine, spruce or poplar, or even hardwood. Whether it would be advisable to reserve just such a piece of country which thirty-four years ago was as bare of vegetation as a billiard-ball or an egg, is a question which it may be worth while for the Government to consider.

"I have recently heard of a Canadian pine and conifer forest growing in Germany which was seeded sixty years ago and is now flourishing. Baron Fuerstenberg's father it was who planted the seeds of Canadian conifers in Gammertingen, Germany, these long years since, and I have learned that they now have a forest worth while cutting. It would be interesting to ascertain the quality and quantity of lumber that can be cut from these trees.

"I would strongly advise anyone wishing to see a young pine forest, to visit the thick woods of Ironsides, along the line of the Canadian Pacific Railway between Ironsides station and Chelsea, within the 'Ottawa District.'

"H. M. AMI.

"Ottawa, Dec. 6th, 1904."

DISCUSSION.

In the discussion which followed, Mr. W. T. Macoun described the results of the experiments in tree-planting made at the Central Experimental Farm in Ottawa since 1887. Here a forest of the Scotch pine grows well. Several plantations of white pine also had been made in three different ways : five feet apart, ten feet apart, and with mixed trees. He remarked that shade killed pine trees. Prof. Macoun remarked that poplar and birch were the scrub in which pine delighted to grow. Poplars and birches came and died, then the pines and elms survived and flourished. He reiterated a statement made by him before the Forestry Conference in Toronto, in 1903, to the effect that pine trees grew from the seeds which came up out of the ground where the squirrels and other small mammals had stored them. White pine grew from decaying logs for the most part. Mr. Hamilton stated that at the River Désert, up the Gatineau, in 1874, four

years after the big fire, he saw poplars growing, and seventeen years after the pine trees were one foot thick at the stump. He believed that trees flourished best when thickly planted. He had noted the fact that pine trees growing in light soil had lighter colored leaves than those grown in richer and darker loam. Mr. Stewart pointed out that broad-leaved trees and other forest weeds killed smaller pines. Mr. W. T. Macoun further remarked that during an outing last fall with Mr. Elwes, of England, an enthusiastic forester, when a traverse was made from Kingsmere to the Gatineau river, through the forest, they had noticed young pine trees growing almost invariably upon the decaying trunks of fallen trees. He believed that the Scotch pine would thrive in America, and in our Northwest especially would be a welcome grower. Seedlings of the Scotch pine (*Pinus sylvestris*) grown in Canada at the Central Experimental Farm had already been planted. There were three Old Country trees in Canada doing very well, namely, the Scotch pine, the Norway spruce, and the European larch.

Among the specimens exhibited were *P. inops* from the New Jersey barrens, and *P. Taeda* from Georgia.

THE THREE SPRUCES.

Mr. W. T. Macoun then spoke on the three spruces, *Picea rubra*, *P. nigra* and *P. alba*. The first grew in the east only, while the other two grew from Prince Edward Island to the Rockies. Black spruce grew in damp and wet places; white spruce grew best on the margins of swamps or edges of moist land; whilst red spruce grew on farms on high lands. He exhibited specimens of eleven spruces growing at the Central Experimental Farm, amongst which we note: *P. Omorica*, *P. orientalis*, *P. excelsa*, *P. Engelmanni*, *P. obovata*, *P. Sitchensis*, *P. pungens*, *P. Alcockiana*, besides fine examples of the three Canadian spruces, black, white and red. Mr. Macoun pointed out the differences which existed between the various species shown, as well as their resemblances.

Prof. Macoun pointed out, and Mr. Stewart supported him in the view, that the black spruce (so-called) of commerce in New

Brunswick was *red* spruce proper (*P. rubra*). Mr. Stewart enquired if it was known that black spruce grew any merchantable size anywhere. No one had ever heard of black spruce making merchantable wood.

Prof. Macoun had collected the three spruces at Eastman's Springs, near the Mer Bleue. In the latter bog the black spruce was common. He had noted a *law* in the fruiting of spruces, namely, that white spruce always had the top cones on the tips of the branches hanging down; red spruce had them half-way down; whilst black spruce had its cones close to the trunk, and these stay on for ten years, and even over twenty years. White spruce lose their cones soonest, red next. You will generally find the cones of the white spruce tree on the ground. Pollination in spruces was also discussed by Prof. Macoun. He stated that whereas the tops of spruce trees were often crowded with cones, as much as a bushel at the very top, the lower limbs of the tree were covered with pollen.

Regarding the character of colour of the wood of the spruces, it was noted that the wood of the white spruce was white, that of the black spruce more resinous and hence darker, while the colour of the wood of the red spruce was very near that of the black, hence the term "black spruce" given to red spruce in New Brunswick and elsewhere. In the discussion, Messrs. Campbell, Clarke, Attwood and others took part. Through the kindness of Prof. D. P. Penhallow, of the Botanical Laboratory of McGill University, Montreal, Mr. Ami was able to show, with the aid of the microscope, thin sections of the three spruces discussed during the evening. Microscopical sections revealed the structure of wood beautifully, and marked differences were observed. The microscopical test was always crucial and proved most satisfactory.

WHAT IS NATURE STUDY ?

Putting the definition of the Nature Study movement in one concrete sentence, I should state it as follows: "The Nature Study movement is the outgrowth of an effort to put the child into contact and sympathy with its own life."

L. H. BAILEY, Ithaca, N.Y.

NATURE STUDY—No. XXI.

NATURE STUDY IN THE SCHOOLS OF NOVA SCOTIA.

(A Historical Sketch.)

By DR. A. H. MACKAY, Superintendent of Education for Nova Scotia,
Halifax, N.S.

A systematic course of oral and objective study was outlined in the first conspectus of a course for the schools of the province, which was presented to the Provincial Educational Association at Truro on the 14th day of July, 1880, by the Principal at that time of the public schools and Academy at Pictou. This was done on the invitation of Dr. David Allison, then Superintendent of Education for the province. After due discussion the conspectus was referred to a committee for simplification and presentation at the convention held the next year, where it was further discussed and passed, practically in the form in which it was soon after prescribed by the Council of Public Instruction for the first eight grades of the public school system, known as the common school grades, in the year 1881.

In 1887 "The Educational Review," which has ever since been continuously published at St. John, N.B., was started with the object of developing the Nature Study side of the course, as well as serving incidentally as a teachers' organ for the Atlantic provinces of Canada. Illustrated lessons on natural objects were prepared, the most continuous being the series under the title "Ferndale School." The whole environment of common school life was more or less covered, instruction for teachers on various subjects, including even the evening sky, which was illustrated by a series of star maps. The Ferndale series dealt with the biological side mainly; but other pages covered mineralogy, physical phenomena of common range, and so forth, before any general effort appears to have been made in the educational press of the other provinces of Canada.

A little later, 1901, a Science building was erected in connection with the Provincial Normal School; and the Provincial School of Agriculture founded by the Government a few years earlier, was then more completely affiliated with it. An extra course of two years in the sciences underlying the art of agriculture was

given to teachers who could take this extra time, for which a special diploma and prize were awarded, and an additional provincial grant of \$100 when they were engaged in teaching in an efficient rural school. This idea has been carried out in a fuller manner by Dr. James W. Robertson, director of the Sir William C. Macdonald Rural School Fund, when \$175,000 were donated to build the Macdonald Institute of Nature Study, etc., at Guelph, in Ontario, and additional funds were provided for Nature Study teachers and school garden demonstrations.

For about twenty-four years the idea has been in the public course of study, developing gradually from morphological to biological observation—from the observation of forms to the observation of action. For a number of years records have been made of the biological and meteorological facts capable of being accurately observed by pupils and verified by teachers, such as the dates of first flowering, leafing and fruiting of plants; the migration of birds; thunderstorms, frosts, high and low water, etc. These have proven so valuable as scientific records, that for some years they have been annually compiled into averages for the different regions of the province as well as for the whole province. The schedules have to some extent been utilized in the other provinces of Canada, and a similar system has been introduced in imitation of it into some of the schools of Denmark. The main object of the scheme originally was to give some objective work to the pupils on their way to and from school, to be reported to the teacher in school. These schedules are being carefully bound up into annual volumes, for the benefit of future students of climatic and ecological conditions in the province.

In the provincial course of study special directions are given for each of the eight grades of the common schools. The general directions published in each school register give in brief form the substance of the *special* directions published annually in the "Journal of Education," which is the official bulletin of the Department, sent free twice a year, in April and October, to each school board in the province. These general directions, which indicate the view taken by the Nova Scotia Education Department of the character and importance of this elementary work in the public schools, are as follows :

"NATURE STUDY.—The noting, examination and study of the common and more important natural objects and laws of Nature as they are exemplified within the range of the school section or of the pupils' observation. Under this head, pupils should not be required to memorize notes or facts which they have not, at least to some extent, actually observed or verified for themselves. Many books on the list recommended for school libraries (see October "Journal," 1903) are useful guides to the teacher for portions of the work prescribed in some of the grades. There should be a short "Nature Lesson" given every day on the daily collections and observations of the pupils themselves—not on the statement of teachers or books—the lesson always being based on the objects or observations. These guide books are to be used only to show the teachers how to give such lessons. They are entirely prohibited as text-books for either pupil or teacher, for under no circumstances should 'notes' from the books be given to pupils. All such studies must be from the objects. Observations under this head form some of the best subjects for English composition or drawing exercises in all grades.

"In schools with pupils of several grades under one teacher (as in most rural schools), many of these lessons may profitably engage the whole school. In nearly all, either the whole senior or whole junior divisions of the school can take part. A skilful teacher can thus give profitable object lessons to several grades of scholars at once; at one time giving a Grade V lesson, at another time a Grade VI or Grade VII or Grade VIII lesson, which will also contain enough for the observation and interest of Grade I, Grade II, Grade III and Grade IV pupils. An object lesson given to the highest class can thus, to a certain extent, be made a good object lesson for all the lower classes. The older pupils will see more and think more."

"It must be remembered that the memorizing of notes and facts merely stated to pupils is strictly forbidden under this head. Such memorizing is pure cram, and is injurious instead of being useful. The teacher may not have time to take up in class every object indicated in the Nature lessons of the course. In such cases the pupils should be given two or three objects nearly related to the typical specimen examined in school, with directions to search for

and examine them at home, as illustrated in the specimen class lesson. Without much expenditure of time the teacher can note that this work has been honestly attempted to be done by each pupil. The lessons must be direct from Nature itself, but under the guidance of the teacher, who can save time in bringing the pupils to the point desired by his more matured experience. They are intended to train the observing and inductive faculties, to show the true way of discovering something of the nature of the world which immediately surrounds us and which is and will continue to be reacting upon us in one manner or another. This knowledge is so much power over Nature, from which we have to win our material existence. It is also essential as an element in any true and useful system of philosophy.

"More stress has been laid here on the natural history of each section than on elementary physics and chemistry. Not because physical phenomena are less important; but because the elements of these sciences are the same all the world over, and there is no end to the cheap and well illustrated guides to practical work in them which will well suit a section in Nova Scotia as well as one in England or in the United States. But there are no such simple guides in the biology of each section, nor in many others of its scientific characters. The teacher, then, must become a student and master himself; for such exercises have special power in developing the habit of accurate observation (which is the soundest basis for any career, ranging from that of the poet and professional man to the tiller and lord of the soil, the tradesman, the manufacturer, the inventor) and in developing in connection with history and civics an intelligent attachment to both the material and ideal features of our country."

These quotations are from the official instructions published annually for a number of years. They will in future be still further modified, it may be assumed, so as to utilize the ideas and principles now being developed in so many countries, many of which have been so effectively set forth in THE OTTAWA NATURALIST series of articles.

MARCH, 1905.

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CONTENTS.

	PAGE
1. President's Address, by W. T. Macoun.....	213
2. New British Columbian Rosaceæ, by Edw. L. Greene. ..	215
3. Some of the Rarer Plants of Wellington County, Ont., collected by A. B. Klugh.. ..	217
4. Meetings of the Entomological Branch	219
5. Botanical Branch	223

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THE OTTAWA NATURALIST.

VOL. XVIII.

OTTAWA, MARCH, 1905.

No. 12

PRESIDENT'S ADDRESS.

W. T. MACOUN.

Members of the Ottawa Field-Naturalists' Club, Ladies and Gentlemen :—

About this time last year we celebrated the 25th anniversary of the organization of the Ottawa Field-Naturalists' Club, and it was with feelings of gratification that many of the original members of the Club came together and told of the work which had been accomplished by the Club during the past twenty-five years. Another year has gone since then and the Club has entered upon its second quarter century ; let us hope that there will be continued progress in the study of Nature in the Ottawa district, and that we shall realize even more than we have done in the past, what a broad field of work there is, and how little is yet known in the wonderful realm of Nature which lies about us. We can, however, look back over the past year's work with some satisfaction and feel that there is still a bright future for the Club. Although planned by last year's Council, the first work of this year was the evening devoted to Practical Demonstrations of How to Collect and Preserve Natural History Specimens, on April 5th, 1904. This proved very successful. The meeting was well attended, the demonstrations were good, and the numerous questions which were asked showed that this was a popular way of teaching Natural History and of interesting people in the study of it. It is expected that this will be repeated, in some respects at least, next spring.

During the spring, summer and autumn three general excursions were held and six sub-excursions. References have been

made to some of these in THE OTTAWA NATURALIST, and fuller particulars regarding them will be given in the Annual Report of the Council. While at these excursions there is not very much new work done, it is felt that their principal value is in the assistance which the leaders of the Club are able to give at these times to those who are beginning the study of Natural Science and to the delightful outing which they afford to those who, perhaps, may be induced by seeing the enthusiasm of others, and the many attractions which the study of Natural History affords, to investigate for themselves, and thus develop a love for such work.

The Botanical Branch of the Club, which last winter held so many successful meetings at the homes of the members, has begun work this winter with much enthusiasm, and those who attend these meetings feel that in no way can Natural History be studied so well as among a small band of enthusiasts, each with his own views on certain questions and eager to give expression to them. The Entomological Branch will shortly resume its meetings also, and it is hoped that the Ornithologists will soon organize.

There has probably never been a more popular, and at the same time a more valuable, volume of THE OTTAWA NATURALIST than that of the current year. There has been a number of bright articles which have attracted the attention of members who do not always read THE NATURALIST carefully. The series of Nature Study articles continues to be of a very high order, and it is hoped that more members of the Club will take advantage of the pages devoted to Nature Study to give expression to their enthusiasm. There must be many members of the Club who are just bubbling over with good things, if they would only present them. The Editor of THE NATURALIST informs me that he finds it very difficult to get material for THE NATURALIST from local members, and if outsiders did not appreciate the advantages of publishing articles in THE NATURALIST he would be very short of material. Let us try and do better in the future. All lovers of Nature should be able to contribute something from personal observation that would be interesting and useful to others.

We invite you to study the Programme of Soirées for this winter. A change has been made this year in the character of the

programme, and the meetings will be more informal than they have been for some years. It is believed that greater good will be accomplished by giving more time for general discussion. A glance at the subjects which are to be discussed and the men who will present them is sufficient to show what is in store for the members of the Club this winter.

I desire to express on behalf of the Club our feelings of appreciation for the use of the rooms at the Normal School and for the courtesy shown by Principal White.

It is with feelings of deep regret that we have to record the loss of a member of the Ottawa Field-Naturalists' Club who was always during the last twenty-two years of her lifetime one of the Club's most valued and best friends. I refer to Miss A. M. Harmon, whose sad death startled us not many weeks ago. If there was ever one who felt the thrill which Nature gives at times to those who know and feel her charms, Miss Harmon was one. She was one of the most faithful members of the Club, and attended regularly its excursions, soirées and annual meetings. The members of the Club will miss her kindly face this winter, and I am sure will trust that her love for Nature is expanding in that broader field beyond the grave.

Ladies and gentlemen, members of the Ottawa Field-Naturalists' Club, I anticipate a most enjoyable and profitable series of meetings this winter.

NEW BRITISH COLUMBIAN ROSACEÆ.

By EDW. L. GREENE.

MALUS MACOUNII. Tree, 20 feet high, four inches in diameter: leaves ample, rather thin, oval, mostly obtuse, from slightly to conspicuously 3-lobed, 2 to $3\frac{1}{2}$ inches long, $1\frac{1}{2}$ to $2\frac{1}{2}$ inches wide, sharply serrate, glabrous on both faces even when young: pedicels nearly glabrous and exterior of calyx wholly so, only the inner face of the acutely triangular reflexed lobes tomentulose: corolla, large, white: fruit not seen.

Margin of Chilliwack Lake, B C., 7 and 13 July, Mr. J. M. Macoun. Thoroughly distinct from *M. rivularis* by its broad

obtusish thin glabrous 3-lobed foliage, and equally peculiar pedicels and calyx.

FRAGARIA LATIUSCULA. Low and not slender, the parts rather firm, peduncles 3 to 6 inches high, the leaves nearly as long, both peduncles and petioles villous with spreading hairs : leaflets pale, glaucescent and almost glabrous above, glaucous and pilose-pubescent beneath : leaflets in the largest leaves not very dissimilar, all on uncommonly long petiolules, very broadly cuneate-obovate, 1 to $1\frac{3}{4}$ inches long and nearly as broad, those of smaller earlier leaves even broader than long, all coarsely, deeply and evenly crenate : calyx-segments quadrate-oblong, very acute, the elliptic bracteoles quite as long : corolla $\frac{3}{4}$ inch broad, the petals mostly broader than long and overlapping : achenes large, superficial.

Chilliwack Valley, also by Mr. Macoun, 1891; 34,337, 34,338 and 34,339 of the Geological Survey collection.

FRAGARIA RETRORSA. Slender, soft and delicate woodland plant 6 or 8 inches high ; petioles, peduncles and pedicels retrorsely long-villous : leaflets light-green above and with few scattered hairs, underneath pale and glaucescent as well as more hairy, especially along the fine whitish veins, the middle one rather acutely obovate-rhomboidal, 1 or 2 inches long, the laterals similar but oblique, the teeth of all minutely cuspidate-apiculate : calyx-segments almost caudately acuminate : corolla small for plant, about $\frac{3}{4}$ inch wide ; petals round-obovate, not overlapping, dull white, turning red in drying : fruits large, subglobose : achenes superficial.

Collected in the Chilliwack Valley 1901 by Mr. J. M. Macoun and distributed under Geol. Surv. No. 34,336. No. 34,335 may be specifically the same, but in this the pubescence is scanty and scarcely retrorse ; but if habit, foliage and flowers offer here the essential marks of a species, the two numbers must bear the same specific name.

SOME OF THE RARER PLANTS OF WELLINGTON
COUNTY, ONT.

Collected by A. B. KLUGH.

AZPHRODIUM BOOTIL. Very rare. One plant only found, in a cedar swamp near Guelph, Ont. June 28, 1903.

ASPLENIUM VIRIDIS. Rare. Moist mossy rocks near Guelph, July 6, 1903.

MUHLENBERGIA SYLVATICA. Common in places along the River Speed, near Guelph.

SPOROBOLUS VAGINÆFLORUS. Abundant along roadsides throughout the southern half of Wellington Co.

ARRHENATHERUM AVENACEUM. Roadsides south of Guelph.

POA ALSODES. Fairly common in woods south of Guelph. This is not the type of *alsodes* but a glabrous-glumed form with few and long branches, thus somewhat approaching *P. debilis*, but distinguished from that species by the very acute flowering glumes and the longer and broader leaves.

PUCCINELLIA DISTANS. Along roadsides south of Guelph.

AGROPYRUM CANINUM. Common in some thickets south of Guelph.

ARETHUSA BULBOSA. Fairly common in an open bog south of Guelph.

ORCHIS ROTUNDIFOLIA. Frequent in a bog south of Guelph.

HABENARIA TRIDENTATA. Frequent in an open bog south of Guelph.

HABENARIA LACERA. Common in an open bog south of Guelph.

SALIX AMYGDALOIDES. Very common in Wellington Co. and wherever I have been in southern and south-central Ontario. In the southern portion of Wellington Co. it outnumbers *S. nigra* twenty to one. Usually passed over for *S. nigra*, but easily distinguished by the leaves being glaucous beneath instead of bright green as in *S. nigra*.

SALIX SERISSIMA. Fern. Rather scarce in southern Welling-

ton. A very distinct species (*Rhodora*, Jan., 1904) recently separated from *S. lucida* by Dr. Fernald. The capsules of this species do not dehisce until late in October or the beginning of November, while those of *S. lucida* do so in June.

SALIX PURPUREA. Rare. A shrub near Puslinch Lake, in the south of the county.

SALIX SERICEA. Our most abundant willow.

SALIX PETIOLARIS. Scarce.

NYMPHÆA RENIFORMIS. Common in Puslinch Lake.

ADLUMIA CIRRHOSA. Scarce. Rockwood, Ont.

LEPIDIUM CAMPESTRE. Scarce.

LEPIDIUM INTERMEDIUM. Our common *Lepidium*. I have not yet found *Virginicum* here.

BARBAREA VULGARIS. Scarce.

ALYSSUM CALYCINUM. Common along roadsides south of Guelph.

AMELANCHIER CANADENSIS ROTUNDIFOLIA. Common at Puslinch Lake.

PHUS VENENATA. Rare at Puslinch Lake.

VICIA TETRASPERMA. Along the C. P. R. track near Killean, Ont.

VIOLA SELKIRKII. Rare.

LYTHRUM SALICARIA. Rare. At the west end of Guelph by the roadside.

CONIOSELINUM CANADENSE. Common in bogs and damp ground in the south of the county.

ANGELICA ATROPURPUREA. Common near Guelph and eastward in the county.

MONOTROPA HYPOPITYS. Scarce at Puslinch Lake.

MONARDA DIDYMA. Common along the Speed west of Guelph.

VERBENA STRICTA. Rare at Puslinch Lake.

VIBURNUM CASSINOIDES. Scarce.

LONICERA OBLONGIFOLIA. Rare at Puslinch Lake.

LACTUCA HIRSUTA. Common at Puslinch Lake.

AMBROSIA TRIFIDA. In a yard in Guelph.

SOLIDAGO PATULA. Very common at Puslinch Lake.

SOLIDAGO NEGLECTA. Very common at Puslinch Lake.

BELLIS PERENNIS. Mr. Sunley's lawn, Guelph.

ASTER SAGITTIFOLIUS. Frequent.

POLYMNIA CANADENSIS. In two localities near Guelph.

CARDUUS NUTANS. Common in some pastures and in places along the roadside near Guelph.

MEETINGS OF THE ENTOMOLOGICAL BRANCH.

Meeting No. 20 was held at Dr. Fletcher's rooms on Feb. 2nd, 1905. The chairman, Dr. Fletcher, opened the meeting with an address on the use of Insects in Nature Study, pointing out the difficulties of using and preserving such small and fragile objects. He advocated the examination of specimens out of class and the teaching in class from enlarged charts. He opposed strongly the passing of specimens around an audience while a speaker was delivering an address, on account of the confusion thus caused. Suggestions were made as to species of common insects which would be particularly suitable for study by students, each of whom should have the same insect under consideration at the same time. Insects mentioned were the Clouded Sulphur butterfly (*Colias philodice*) of which eggs could be obtained easily by enclosing a female in a gauze bag over a plant of white clover, planted in a flower pot. Each student could easily provide the food plant and secure the egg laying female. The Camberwell Beauty, the Small Tortoise-shell, the Graptas and Cabbage White butterflies, all of which could be easily obtained and all of which had short life-histories were also recommended.

Mr. D. A. Campbell in discussing the address gave his experience of ten years in teaching natural science and nature study. He had noticed the same difficulty of confusion in the class but believed in making the students examine the specimens very carefully and thought that they did this better when in class at a specified time than outside whenever opportunity arose. Another difficulty

was in finding enough specimens for the whole class to examine at once.

Mr. Arthur Gibson read a paper describing the life-history of *Eupithecia interruptofasciata*, a small geometrid moth which he had reared from larvæ found on *Juniperus communis* by Mr. W. Metcalfe, at Hull, Que. Specimens were exhibited.

Mr. W. Metcalfe described the finding of 42 specimens of *Pachyta rugipennis* which he had taken upon a dead pine tree on May 29 last. The females were ovipositing and every one of these had about half a dozen males in attendance. This is an extremely rare insect and had never previously been recorded from Ottawa. A few days afterwards Mr. Metcalfe revisited the tree but could not find a single specimen.

Mr. Jos. Keele gave a most interesting account of an expedition made by him during the past season along the Mayo Lake and in the valley of the Mayo River, Yukon Territory, describing the animals and fishes there observed. Among the insects brought back by Mr. Keele was a beautiful specimen of *Papilio machaon*, var. *aliaska*, and a rubbed but undoubted specimen of *Eurymus boothii*, which answered exactly to a figure of the species published by Mr. H. J. Elwes, in the Transactions of the Entomological Society of London, part III, 1903.

Mr. C. H. Young, exhibited a box of exquisitely mounted geometers taken during the past summer at Meach Lake, Que.

Mr. Andrew Halkett showed specimens of the pupæ of the Tomato Sphinx and casts of some dragonfly nymphs, including *Didymops transversa*.

Mr. J. W. Baldwin referred to insects imported with bananas and showed specimens of cockroaches thus brought to Ottawa.

Mr. Norman Criddle, of Aweme, Man. was present and joined in the discussions.

Meeting No. 21 was held at the residence of Mr. W. Simpson on the 16th Feb., 1905, Mr. Simpson in the chair. The first half hour was pleasantly spent examining the chairman's large collection of local coleoptera, which comprises many rare species. Mr. Simpson, while the cases were being examined and passed around,

drew special attention to the more interesting specimens and gave notes upon their capture.

The advisability of enlarging the Ottawa district for investigation by members of the Entomological Branch was discussed and the general opinion seemed to be that the limits as shown in the Geological Survey Map of Ottawa, of which a large number had been purchased by the Club, were sufficient for present requirements.

Mr. J. W. Baldwin, showed, among other specimens, a beautiful form of *Calloides nobilis*, which he had taken at Ottawa last summer, also some orthoptera and bees.

Mr. Arthur Gibson showed a complete collection of the Ottawa Halisidotas and promised a paper on them for the next meeting.

There was an interesting discussion upon the habits of Gordius and Mermis, and in speaking on this subject Dr. Fletcher mentioned that both were treated of as parasites of locusts in the annual report of the Entomologist and Botanist to the Dominion Experimental Farms, for 1896, at page 238.

Mr. A. Halkett spoke of the parasitic worms to be found in fishes, and referring to imported insects showed a specimen of the large cockroach, *Periplaneta americana*, which had been brought to Ottawa in a bunch of bananas.

Mr. W. Metcalfe showed a collection of Hemiptera many species of which were new to the Ottawa list, and of which he had recently received the names.

Dr. Fletcher exhibited a box of specimens containing many rare and interesting species, among others *Sphinx canadensis*, taken at Ottawa last season at the unusually late date of Aug. 12, also a fine specimen of *Sesia titan*, taken at Sydney, C. B., by Miss Margaret Brown, of Halifax. Specimens of *Termes flavipes* winged and apterous, from Victoria, B.C., were examined with interest by all present.

Mr. Norman Criddle, of Aweme, Man., showed, among other rarities *Pæctes oculatrix*, which he had taken at Aweme on the 20th June last.

Meeting No. 22 was held at Mr. Halkett's house, Mr. Halkett in the chair. The chairman opened the meeting by drawing attention to a neatly mounted collection of conspicuous insects put up on tablets in an original method, which showed the specimens off to great advantage. There were in this collection many specimens which Mr. Halkett had reared from the larva or egg, and concerning which he gave many interesting notes.

Dr. Fletcher showed two cases of insects such as were prepared in the Division of Entomology, for examination by farmers and fruit growers. Each species was represented in all its stages of development together with its work, and parasites. In these cases were such well known pests as the San Jose Scale, the Variegated Cutworm, and other allied species, Tent Caterpillars, Fall Webworm, and White Spotted Tussock Moth. A description was given of the habits of the Black Sand wasp, *Ammophila luctuosa*, and the way in which it hunted for and carried off cutworms and other larvæ. Mr. Geo. Holland and Mr. Norman Criddle, had both studied these insects and Mr. Criddle mentioned that he had seen in Manitoba on one occasion the same or a similar species carrying off a large sphingid caterpillar. Referring to the Tent Caterpillars, Mr. Holland attributed their sudden disappearance to a severe frost in May, which destroyed all the foliage of the trees upon which the recently hatched caterpillars were feeding, and which extended over a vast area in North America. This view was agreed with by most present who recalled the peculiar condensed growth on some trees that year, where the young twigs, of the new growth, had been destroyed by the frost.

Mr. Gibson read a paper which he had promised at the last meeting on the three species of *Halisidota* which are found in the Ottawa district, and gave much information on the habits of the common but handsome caterpillars of these insects.

J. F. for Sec.

BOTANICAL BRANCH.

On January 26th the following members and friends of the Botanical Branch met at the residence of Mr. A. E. Attwood : Messrs. J. Fletcher, J. Macoun, R. B. Whyte, W. T. Macoun, T. E. Clarke, J. M. Macoun, D. A. Campbell, R. Cameron, W. C. Ewing, J. C. Spence and Norman Criddle.

The greater part of the evening was spent in considering the obstacles to the successful teaching of Nature Study in city public schools. The following difficulties were pointed out by the leader :

1. Lack of time. The curriculum is already crowded, and public opinion is declaring itself in favor of greater thoroughness in the old staple subjects.

2. Lack of material and appliances for study. As is the case with the other two new subjects, Domestic Science and Manual Training, the work must be done by the pupils individually in a place with the necessary equipments. A Nature Study laboratory is as necessary to the successful teaching of elementary science as is a workshop in the teaching of manual training.

3. Lack of definiteness. An educationist has said that the teacher tolerates the product on account of the process, and that the pupil tolerates the process on account of the product. As things are at present, there is no tangible product for work done by the pupils. Even teachers lack a clear conception of the scope of the subject. Nature Study requires to be defined in a way that will appeal to all.

4. A cause of disorder. The frivolity often observable in a large class of small children during a lesson in Nature Study tends to demoralize the class. The orderly freedom necessary to good work in mutual investigation is a difficult condition in classes of forty or fifty young pupils.

5. Lack of popularity. By actual vote of over 200 pupils, it was ascertained that Nature Study is not liked as well as are the ordinary subjects. Unpopularity of any school subject is due either to its essential unsuitability or to the unattractiveness of its presentation by the teacher. There is little doubt that the latter is the chief cause for the present lack of popularity of Nature Study.

All the teachers present, including Professor Macoun, who taught school for many years, felt the force of the difficulties mentioned; the latter declared it to be his conviction that Nature Study would soon be consigned to the limbo of exploded educational fads. Dr. Fletcher was much more optimistic, and believed that the movement would have a permanent effect on the character of the work done in the schools of the future. Mr. J. M. Macoun thought that a competent supervisor of Nature Study should be appointed. Mr. Whyte expressed himself as thinking that the matter of order in a school-room was unnecessarily emphasized. Mr. W. T. Macoun said that if a clear relation was made to the life of the pupil of the various aspects of Nature Study, there would be no lack of interest in the subject.

The very animated discussion was stopped in time to give the gentlemen an opportunity of examining the wonderfully accurate and exceedingly artistic pictures of plants painted by Mr. Norman Criddle in water colors.

A. E. A.

The Botanical Branch met at the residence of Prof. Macoun, Feb. 9th, when all the members but two were present. A proposition to extend the limits of the "Ottawa District" for botanical purposes was discussed and the general opinion was that such an extension would add to the opportunities for work, as some of the Club's members spend the summer near Ottawa but still outside the present limits. Prof. Macoun drew the attention of the members to the very small cost of making a herbarium collection of plants—only \$7 per 1,000 sheets. The mounting paper can be had for \$5 per 1,000 sheets, printed labels may be had for \$1.50 per 1,000, and another \$1 pays for the genus covers.

INDEX

TO THE

OTTAWA NATURALIST, VOL. XVIII, 1904-5.

	PAGE		PAGE
Address, President's.	213	Canada Jay, the	142
Alum Root as a Remedy for		Canadian Species of Trochilites	13
Diarrhoea	76	Canine Intelligence	197
Ami, H. M., Giant Puff-ball	121	Circulation of Fluids in Plants	170
Experiment Illustrating the Cir-		Conchological Notes	91
culation of Fluids in Plants	170	Correspondence	177
Anderson, J. R., Note on the		Council, Report of	7
Ruffed Grouse	141	Criddle, Norman, The Mountain	
Antennarias, Some Canadian	37	Bluebird in Manitoba	85
<i>Antennaria chlorantha</i> , Greene	38		
<i>lanulosa</i> , Greene	38	Diarrhoea, Alum Root as a reme-	
<i>maculata</i> , Greene	39	dy for	76
<i>Sansonii</i> , Greene	37	Dinosaurs. On the Squamoso pa-	
<i>sedoides</i> , Greene	37	rietal Crest of two Horned	82
<i>Aphylostylus</i> , Whiteaves	114	Doyle, D. J., Nature Study at	
<i>gracilis</i> , Whiteaves	115	the Macdonald Institute	193
Barlow, A. E., A Landslide on			
the Lièvre River	182	Eifrig, G., Warbler Songs and	
Beaupré, E., Ornithological Notes	153	Notes	19
Bennett, H. C., School Gardens		Bird Notes	39
in Great Cities	26	Some Underlying Principles of	
Bird Migration	144, 158	Nature Study	77
Bird Notes	39, 144, 154	Some Bird Notes of the Year	118
Bird Notes of the Year, Some	118	Entomological Branch, Meeting	
Birds, Observation on some of		of	55, 104, 199, 219
our rare	138	Evening Grosbeak, The	24
Bluebird, The Mountain, in		Excursions	75, 89
Manitoba	85		
Botanical Branch, Meetings		Flora of the Peace River Region	115
of	58, 157, 202, 223	Fletcher, J., Alum Root as a Re-	
Botanical Club of Canada	120	medy for Diarrhoea	76
British Association, The Presi-		<i>Fragaria latiuscula</i> , Greene	216
dent's Address	129	<i>retrorsa</i> , Greene	216
British Columbian Rosaceæ, New	215	<i>Fringillida</i> , The Winter, of New	
Butterflies and Moths, The Col-		Brunswick	165
lection and Preservation of	123		
<i>Calopogon pulchellus</i> , The Ferti-		Gibson, Arthur, The Collection	
lization of	107	and Preservation of Butter-	
		flies and Moths	123

PAGE	PAGE
Grant, Sir James, Canine Intelligence..... 107	<i>Margaritana deltoidea</i> 91
Grasping Power of the Manus of <i>Ornithomimus altus</i> 33	M. E., My Birds and how they came to me..... 73
Greene, E. L., Some Canadian Antennaries..... 37	A serious Misunderstanding between my Squirrel and me 176
New British Columbian Rosaceæ..... 215	Members, List of..... 4
Grosbeak, The Evening..... 24	Merganser, Unusual Nesting Sites of the American..... 157
Guillet, Cephas, Relationship Between the weather and Plant Growth..... 40	Migration, The Annals of the Fall 174
Harrington, W. H., An October Tramp..... 155	Mollusca, Introduced..... 92
Heronry near Eganville..... 119	New to Canadian Fauna..... 18
Jay, The Canada..... 142	Moore, W. H., Notes Concerning New Brunswick Warblers.. 98
Kells, W. L., Nesting of Some Canadian Warblers..... 65	The Canada lay..... 142
Klugh, A. B., The Fertilization of <i>Calopogon pulchellus</i> 107	The Winter Fringillidæ of New Brunswick..... 165
The Annals of the Fall Migration..... 174	Mushrooms, Note on the Food Value of Certain..... 87
Some of the Rarer Plants of Wellington County..... 217	My Birds and How they came to me..... 73
Lambe, L. M., The Grasping Power of the Manus of <i>Ornithomimus altus</i> 33	Nature Study and Camera 161
On the Squamous Parietal Crest of two Species of Horned Dinosaurs..... 82	Nature Study at the Macdonald Institute..... 193
Landslide on Lièvre River, ... 182	Nature Study in the School of Nova Scotia..... 209
Latchford, F. R. Introduced Mollusca, ... 92	Nature Study in Winnipeg Schools 61
<i>Margaritana deltoidea</i> ... 91	Nature Study, Some underlying Principles of..... 77
Lièvre River, A Landslide on ... 182	Nature Study, The Prescribed Course for Public Schools .. 145
Macdonald Institute, Nature Study at..... 193	Nature Study Papers, 26, 61, 77, 93, 109, 123, 145, 161, 193, 209
Mackay, A. H., Nature Study in the Schools of Nova Scotia 209	Nesting of Some Canadian Warblers..... 65
Macoun, J. M., The Flora of the Peace River Region..... 115	<i>Ornithomimus altus</i> , Grasping Power of the Manus of 33
Macoun, John, Huge Puff-balls. 23	Peace River Region, The Flora of..... 115
Macoun, W. T., How to Collect and Preserve Plants, ... 93	Pelican, A White, at Manotick. 71
How to mount Plants and Complete the Herbarium..... 109	Pelican, The Brown, on Cape Breton Island..... 108
President's Address..... 213	Plants, How to collect and Preserve..... 93
<i>Malus Macounii</i> , Greene..... 91	Plants, How to Mount and Complete the Herbarium..... 109
	Plants, Some of the Rarer, of Wellington Co..... 217
	President's Address..... 213
	Prince, E. E., The British Association President's Address. 129

	PAGE		PAGE
Programme of Soirées	180	Tramp, An October.....	154
Puff-ball, Giant.....	122	Treasurer, Report of	12
Puff-ball, Huge.....	23	Trocholites, Canadian Species of	13
Raine, W., Discovery of the eggs		<i>Trocholites ammonius</i> , Conrad.	14
of Solitary Sandpiper.....	135	<i>Canadensis</i> , Hyatt.....	16
Unusual Nesting Sites of the		<i>planorbiformis</i> Conrad..	15
American Merganser	153	Walker, Bryant, Mollusca New	
Relationship between the Wea-		to Canadian Fauna.....	18
ther and Plant Growth. ..	40	Wallis, J. B., Nature Study in	
Reviews.....	159, 192	Winnipeg Schools, ...	61
Rosaceæ, New British Columbian	215	Warbler Songs and Notes	19
Ruffed Grouse.....	144	Warbler, A Red-letter day for..	118
Rugose Corals, Description of a		Warblers in Compton County, ..	149
New Genus and Species of	114	Warblers, Nesting of Some Cana-	
Sandpiper, Discovery of the		dian.....	65
Eggs of the Solitary	135	Warblers, Notes Concerning	
School Gardens in Great Cities	26	New Brunswick	98
Shutt, Frank T., Note on the		Wellington Co., Some of the Ra-	
Food Value of Certain Mush-		rer Plants of.....	217
rooms.....	87	Whiteaves, J. F., The Canadian	
Nature Study and the Camera	161	species of Trocholites.....	13
Sinclair, S. B., The Prescribed		A White Pelican at Manotick	71
Course in Nature Study for		The Brown Pelican on Cape	
Public Schools.....	145	Breton Island	108
Solitary Sandpiper, Discovery		Description of a New Genus	
of the Eggs of	135	and Species of Rugose Corals	114
Squirrel, A Serious misunder-		Winnipeg Schools, Nature Study	
standing between my Squir-		in.....	61
rel and me.....	147	Young, C. J., The Evening Gros-	
Terrill, Summer Warblers in		beak.....	24
Compton County, Que.....	169	Observation on Some of our	
		Rare Birds.....	138

APRIL, 1905.

VOL. XIX, No. 1

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CONTENTS.

	PAGE
1. List of Members of the Ottawa Field-Naturalists' Club.	4
2. The Report of the Council of the Ottawa Field-Naturalists' Club for the year ending March 19th, 1905....	7
3. Treasurer's Report for the year 1904-05	13
4. A New Recent Marine Sponge (<i>Esperella Bellabellensis</i>) from the Pacific Coast of Canada, by Lawrence M. Lambe, F.G.S., F.R.S.C.	14
5. Notes on Fresh-water Rhizopods, by W. S. Odell	16
6. Nature Study—No. 22 ..	21

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OTTAWA, JUNE, 1905.

No. 3

NOTES ON SOME FRESH-WATER SHELLS FROM THE YUKON TERRITORY.

By J. F. WHITEAVES.*

Among the zoological collections in the Museum of the Geological Survey of Canada, there are a few fresh-water shells from the Yukon Territory, which have not yet been reported upon, though they are by no means devoid of interest to the student of the geographical distribution of the mollusca.

Most of these shells were collected by the late Dr. G. M. Dawson, in 1887, at four localities, viz., from Frances Lake, at the head of the Liard River; from Finlayson Lake, between Frances Lake and the Pelly River; at the Lewes River; and from Lake Marsh or "Mud Lake," one of the tributaries of the Lewes River. The remainder were collected by Mr. Joseph Keele in 1904, from the Stewart River, near Mayo River.

The Cycladidæ in these collections have been kindly determined by Dr. V. Sterki, and most of the Gasteropoda by Dr. W. H. Dall. The species represented in them are apparently as follows.

PELECYPODA.

Sphærium Walkeri Sterki.

Frances Lake, one valve; and Finlayson Lake, two perfect specimens. In 1904 Mr. W. McInnes collected a few living shells, which were referred to this species by Dr. Sterki, from the Attawapiskat River, Keewatin. The types of *S. Walkeri* are from Lake Michigan.

* This paper and the following one are reprinted from 'The Nautilus' for May, 1905.

Pisidium Idahoense Roper.

Stewart River, near Mayo River; one dead but perfect specimen and an odd valve. Dr. Sterki writes that the "anterior part of the hinge of the former is reversed."

Pisidium compressum Prime.

Stewart River, near Mayo River; one specimen. Mr. McInnes has recently collected specimens of this species at Ozhiski Lake, Attawapiskat River; at Kawinogans River, a branch of the Attawapiskat; and at the Winisk River, Keewatin.

Pisidium variabile Prime, var.

Stewart River, near Mayo River; two specimens. Mr. McInnes has recently collected three specimens on the Kawinogans River, which Dr. Sterki has identified with this species.

Pisidium scutellatum Sterki.

Frances Lake, fry only; one specimen. Dr. Sterki has recognized a few specimens of *P. scutellatum* in collections made by Mr. McInnes last year at Ozhiski Lake, and the Kawinogans River, Keewatin.

GASTEROPODA.

Valvata mergella Westerlund (Dall).

Stewart River, near Mayo River; two specimens.

Valvata Lewisii Currier (Dall).

Valvata sincera of Haldeman, C. B. Adams, Dekay, W. G. Binney, and many subsequent American writers, but, according to Dall, not *V. sincera* of Say.

Valvata striata of Lewis, but not of Philippi.

Frances Lake, ten specimens, and Finlayson Lake, two specimens. Presumably similar specimens were previously recorded by W. G. Binney, in 1865, under the name *V. sincera*, as having been collected by Major Kennicott from the Peace River, Upper Mackenzie, and Great Slave Lake. Frances and Finlayson lakes both belong to the Upper Mackenzie drainage system.

Elsewhere in Canada, *V. Lewisii*, as recently identified by Dall, is now known to occur at many localities from Gaspé to Alberta, and as far to the north-eastward as Fort Chimo, Ungava.

A few specimens in the Museum of the Canadian Survey, which Dall thinks are "probably the true *V. sincera* of Say, or a variety of it," were collected on the island of Anticosti by Professor Macoun in 1884, and on the Attawapiskat and Kawinogans rivers by Mr. McInnes in 1904. Those from the Kawinogans River have the outer half of the last volution free and partially uncoiled.

Limnæa stagnalis appressa Say.

Stewart River, near Mayo River; two specimens.

Limnæa Randolphii Baker.

Frances Lake, eleven fine and large specimens; Finlayson Lake, eleven specimens, mostly immature; Lewes River, one small specimen; and Lake Marsh, Lewes River, seventeen fine and mostly adult shells.

Limnæa palustris Muller.

Frances Lake, two specimens.

Limnæa VahlII Beck (Dall).

Frances Lake, nine specimens; Finlayson Lake, twelve specimens.

Limnæa arctica Lea (Dall).

= *Limnæa PingelII* Beck, var. (Dall).

Stewart River, near Mayo River, two specimens.

Planorbis trivolvis Say.

Stewart River, near Mayo River, seven specimens of a rather large, depressed and thin-shelled form of this species, with the spiral angulation obsolete.

Segmentina armigera Say.

Stewart River, near Mayo River; one specimen.

Physa sp. indet.

Finlayson Lake; one very immature specimen.

Ottawa, April 5, 1905.

LISTS OF A FEW SPECIES OF LAND AND FRESH-WATER
SHELLS FROM THE IMMEDIATE VICINITY OF
JAMES BAY, HUDSON BAY.

By J. F. WHITEAVES.

The shells referred to in the following lists were collected by Messrs. O. O'Sullivan and W. Spreadborough, at three localities near James Bay, on behalf of the Geological Survey of Canada, and are now in its Museum :

1. From two miles above the mouth of the Harricanaw River, Hannah Bay, collected July 1, 1904.

(A. Land Shells.)

Cochlicopa lubrica (Muller). Several specimens.

Vitрина limpida Gould. Eight specimens.

Zonitoides arboreus (Say). Two specimens.

Pyramidula striatella (Anthony). Four specimens.

Succinea retusa Lea (*S. ovalis* Gould non Say). Several specimens.

(B. Fresh-water Shells.)

Limnæa stagnalis appressa. Ten specimens.

Limnæa Vahlîi Beck (teste Dall). Eleven specimens.

Limnæa truncatula Muller (teste Dall). Several specimens.

Bulinus hypnorum (L.). Eight specimens.

Planorbis trivolvis Say. Two specimens.

2. From the mouth of the Moose River, about a mile below Moose Factory, collected July 15, 1904.

Lampsilis luteolus (Lamarck). Two specimens.

Anodonta marginata Say (= *A. fragilis* Lamarck). Three specimens.

3. From the mouth of the Albany River, about a mile below Fort Albany, collected July 25, 1904.

Planorbis albus Muller (= *P. hirsutus* Gould). Several specimens

Ottawa, April 8, 1905.

NATURE'S METHOD OF RE-SEEDING TO WHITE AND RED PINE.

By P. COX, Chatham, N.B.

The discussion on "Conifers" at the meeting of the Botanical Branch of the Ottawa Field-Naturalists' Club, as published in the February number of THE NATURALIST, was very interesting. For many years I have observed the methods of Nature in the work of re-forestation, and in a few words shall give you the results.

White and Red Pine do not spring up immediately after a fire. Other plants, such as the birches, maples, poplars, willows, cherry (*Prunus pennsylvanica*), shrubbery of various kinds, trailing plants, grasses, mosses, liverworts, etc., soon take possession of the fire-swept area, to be followed in a few years by the Conifers, including the pines. The Northern or Scrub Pine (*Pinus Banksiana*) is, to a certain extent, an exception; for in some districts, especially "barrens" more or less sodden in spring and early summer, it follows almost on the heels of a fire, and its foliage is generally, on such a soil, yellowish, as remarked by Mr. Hamilton in the discussion,—a character I have failed to notice in the case of the White and Red Pine.

How are burnt areas re-seeded to the latter? Under ordinary forest conditions, Prof. Macoun is, I believe, quite right in ascribing to seed-bearing cones, buried by squirrels and other animals, a share in the work; but the re-seeding of burnt districts can hardly be thus explained; for, the surface mould and soil being swept off, the seeds of buried cones brought near the surface would be apt to germinate under the influence of light and heat, and re-seeding on the heels of the fire would be expected. Such, according to my observation, does not happen. It would seem as if the White and Red Pine are not alkali-loving plants, and their seeds do not germinate and thrive in a soil impregnated with the soluble constituents of ashes, but require much vegetable mould and half decomposed wood—a fact observed by Messrs. W. T. Macoun and Elwes in the traverse from Kingsmere to the Gatineau. This view seems further strengthened by the fact that the first young White and Red Pines appearing on a burnt district are

almost invariably found growing on rotten trunks and stumps which had in part escaped the conflagration.

The leaching of the surface soil, the gradual consumption of the alkaline constituents by the first growth, and the resulting addition of the necessary vegetable matter will, in a few years, prepare the burnt area for the pines, whose seeds are doubtless wind-sown. Some such conditions seem to regulate the reappearance of the spruces also, and I once observed the Hemlock (*Tsuga Canadensis*) re-occupying its old site after a period of ten or twelve years.

BOTANICAL NOTE.

Erythronium albidum. A nice specimen of this flower has been received from an anonymous correspondent, "E. U. O. M.," of Belleville, Ont., who states that the root was originally collected at Massassaga Point, Bay of Quinte, in 1896. Every year since one flower and two leaves only have been produced. The flower in this species is white, faintly tinged with violet or blue. It is smaller than the common American Dog's-tooth Violet or Adder's Tongue (*Erythronium americanum*) and the leaves are not prettily mottled with brown, as in that species. In Macoun's Catalogue of Canadian Plants it is recorded that, although the species is apparently rare in Ontario, it was abundant in 1878 in a rich low wood two miles east of Belleville, between the Grand Trunk Railway and the Bay of Quinte. Dr. Burgess also found the species on steep clay banks of the River Thames at the "Cove," London, Ont.

J. F.

BOTANICAL CLUB OF CANADA.—The undersigned will be obliged to any botanists who have taken exact dates of the flowering of native plants in the Ottawa district this spring, if they will communicate to him, with a view of making the Ottawa Report to the Botanical Club as complete as possible.

J. FLETCHER, *Sec'y for the Province of Ontario*.

ZOOLOGY.

THE BANDED POCKET-MOUSE.

(Perognathus fasciatus.)

A good specimen of a small rodent, which Dr. C. H. Merriam has identified with this species, has recently been presented to the Museum of the Geological Survey of Canada by Mr. Norman Cripple, who caught it at Aweme, Manitoba, in June, 1904.

The pocket-mice are not very dissimilar to the common house mice, in size and shape; but the former, as their name implies, are provided with cheek pouches, which open externally, and their fur also is very distinctive both in its coloration and texture. Beddard places the pocket-mice next to the kangaroo rats, in the family *Heteromyidae*; but Lydeker says that they can be distinguished therefrom "by the presence of roots to their molar teeth," and adds that most of the pocket-mice are "brownish above and white beneath, with a tawny stripe on the flanks, dividing the dark from the light area." Their hind limbs are described as "scarcely saltatorial," and their fur as "coarse and bristly."

The type of the genus *Perognathus* (*pera*, pouch; and *gnathos*, jaw) is *P. fasciatus*; both the genus and its genotype were first described by Maximilian, Prince of Wied, in 1839.

Audubon and Bachman's brief and altogether unsatisfactory Latin diagnosis of the specific characters of *P. fasciatus*, published in 1856, when freely translated, reads—yellowish gray, white below, with a pale yellow lateral stripe. Baird's definition of its specific characters, published in 1857, is as follows: "Considerably larger than the house mouse. Tail as long as body without the head. Antitragus" (the inner lobe of the ear, opposite the tragus) "conspicuously lobed. Soles naked. Above reddish yellow closely lined with black; fore legs all round, feet and under parts white; a pale reddish yellow immaculate band on each side."

P. fasciatus is said to occur in Mexico, Dakota, Kansas and Manitoba. At least six species of this genus are now known, most of which are inhabitants of the western parts of North America.

Ottawa, April 26, 1905.

J. F. WHITEAVES.

REPORT OF THE ZOOLOGICAL BRANCH, 1904.

The leaders in Zoology have again to report that, while much useful work in this branch of biological science has been done by various members of the Club, there is little of such novelty or importance to record as to justify detailed notice in this annual report. The fact that Ornithology, Entomology and Conchology are dealt with in separate reports, precluding reference to them in the Zoological report, seriously confines the field, so far as important seasonal observations go, as the mammals, fishes, etc., offer themselves less readily to continuous study by naturalists resident in a city. Still the field is a most inviting and promising one, and, as pointed out in previous reports, there are many lines of work which are open to those desirous of adding to our stock of zoological knowledge.

The Hudson's Bay expedition which returned last fall, after fifteen months' exploration in the Arctic waters of Canada, made some interesting contributions to Dominion zoology.

In the Report of the Department of Marine and Fisheries just issued the following resumé is given of the preliminary account furnished by Mr. Andrew Halkett, naturalist on board the SS. "Neptune."

Mammals.—The mammals observed were limited to four orders, the Carnivora, the Rodentia, the Ruminantia, and the Cetacea; and embrace the Atlantic Walrus (*Odobanus rosmarus*), the Ringed Seal (*Pagomys fœtidus*), the Harp Seal (*Pagophilus groenlandicus*), the Hooded Seal (*Crystophora cristata*), the Polar Bear (*Thalartos maritimus*), the Barren-ground Wolf (*Canis albus*), the Esquimo Dog (*Canis familiaris borealis*), the Arctic Fox, (*Vulpes lagopus*), the Polar Hare (*Lepus arcticus*), certain small rodents, such as Marmots and Lemmings, the Musk Ox (*Ovibos moschatus*), the Barren-ground Caribou (*Rangifer arcticus*), the Right Whale (*Balaena mysticetus*), and the Beluga or White Whale (*Delphinapterus catadon*).

Specimens of the skins of several of the mammals, suitable for mounting, were preserved, with a series of skulls, bones, teeth, etc.

Birds.—The skins of about thirty species of birds, embracing over one hundred specimens, were preserved; these include, among others, the Lapland Longspur (*Calcarius lapponicus*), the Snow Bunting (*Passerina nivalis*), the Red Poll (*Acanthis linarius*), the American Raven (*Corvus corax principalis*), the Horned or Shore Lark (*Octocoris alpestris*), birds of prey, various shore birds, including the Red Phalarope (*Crymophilus fulicarius*), the Whistling Swan (*Olor columbianus*), Hutchin's Goose (*Branta canadensis hutchinsii*), the Snow Goose or Wavy (*Chen hyperborea*), the Eider Duck (*Somateria mollissima*), the King Eider (*S. spectabilis*), the Long-tailed Duck or Souwester (*Harelda hyemalis*), the Arctic Tern (*Sterna paradisæa*), various gulls (*Laridæ*), Jægers (*Stercorarius*), the Murre or Brunnich's Guillemot, (*Uria lomvia*), the Sea Pigeon (*Cepphus mandti*), the Red-throated Diver (*Urinator lumme*), and the Black-throated Diver (*U. arcticus*).

Numerous birds' eggs, some of them in sets, a series of birds' nests and avian anatomical preparations were also collected.

Various other species of birds were observed, such as the American Titlark (*Anthus pensilvanicus*), the Rock Ptarmigan (*Lagopus rupestris*), and the Dovekie (*Alle alle*).

Fishes.—The fishes observed, or collected, were various Salmonoids and Codfish (*Gadus callarius*), together with a specimen each of *Lycodes* and *Gymnelis* (dredged), two specimens each of two species of Blennioids (dredged), a Sand-launce (*Ammodytes*). Cottoids or Sculpins, a species of fresh water Stickleback (*Pygosteus*) and a Basking Shark (*Somniosus microcephalus*).

Specimens of various species of insects and of marine invertebrates were obtained, and, when determined, these will form a peculiarly interesting collection.

In this connection, it is appropriate to note that this season and during the last two or three seasons specimens of the Swingle-tail or Thresher Shark (*Alopias vulpes*, Gmelin), have been captured in the waters of eastern Nova Scotia. The species has been hitherto uncommon or unrecorded in these more northerly waters. The Great White Shark or Man eater (*Carcharodon carcharias*, Linn.,) has also been observed more frequently by the sealers in the Gulf of St. Lawrence in recent years. The Mackerel Shark (*Lamna cornubica*, Gmelin,) and the Sand Shark (*Carcharias*

littoralis, Mitchell) have been taken, and unprecedentedly vast schools of Picked Dog-fish or Bone-dogs (*Squalus acanthias*, Linn.) have infested the whole of our Atlantic coast from Gaspé southward. Can it be that our eastern shores are undergoing some change rendering the sea warmer and more attractive to these fishes which usually prefer more southerly habitats? The distribution of species is a most fascinating study and one to which our local zoologists might profitably devote more attention in the future.

E. E. PRINCE.

ANDREW HALKETT,

W. S. ODELL.

CORRESPONDENCE.

The Editor OTTAWA NATURALIST.

SIR,—I am making a special study of the Carices (sedges) of Ontario, and should be very grateful for the co-operation of all Ontario botanists.

It would greatly advance our knowledge, if everybody at all interested in plants would collect all the sedges they come across this summer and fall. They should collect the whole plant, roots and all in duplicate, place a label bearing a number, the locality, date of collection and collector's name in each paper, and press for about four days. This is all the drying sedges need.

At the end of the season mail one lot of duplicates to me (flat, not rolled) marked "Sample Post." I shall be glad to refund the postage and will, upon determining the specimens, send a list of the numbers with the name of the species against them.

One important point to be borne in mind about sedges is that they must be collected in full fruit, that is, when the achene (seed) is fully formed and hardening.

All specimens received will be fully credited to their collector in anything I publish on them.

Yours truly,

A. B. KLUGH.

Guelph, Ont.

The Editor OTTAWA NATURALIST.

SIR,—My attention has just been drawn to an article in the last number of *THE NATURALIST* by R. Chalmers, LL.D., on "The Glaciation of Mount Orford." This article is in the form of a reply to our recent paper by Professor C. H. Hitchcock, Dartmouth College, Hanover, N.H., on "The Glaciation of the Green Mountain Range" (Report of the State Geologist of Vermont, 1903-4, Burlington, Vt.), and to a brief note on the subject of Mount Orford by the present writer (*Canadian Record of Science*, July, 1900). Unfortunately, it is the writers, rather than the subject, that receive the greater share of attention in this article. Yet a few words of explanation may help to remove any misapprehension regarding the latter.

In the annual report of the Geological Survey of Canada Dr. Chalmers advanced the view that Mount Orford and other hills in south-eastern Quebec were not glaciated above an altitude of eighteen hundred feet. In 1898 Professor Hitchcock reported to the American Association for the Advancement of Science that glacial markings and drift were found by him at the summit of Mount Orford in the previous season.

On the appearance of Dr. Chalmers' report, early in 1900, the writer, quite unaware of Professor Hitchcock's investigation, wrote the short paper above referred to, expressing the opinion that the mountain had been glaciated to the top, and that, consequently, the extreme height reached by the ice in south-eastern Quebec is not yet known. When in manuscript, this note was sent to the late Dr. G. M. Dawson, then Director of the Geological Survey, with the request that it should be also submitted to Dr. Chalmers. Dr. Dawson's reply was to the effect that, the writer's view being probably the correct one, there was no objection to its publication. Accordingly, after again visiting the summit of the mountain, the article was published in July, 1900. It is, therefore, only after five years that Dr. Chalmers first expresses his dissent, and that, apparently, without having in the meantime re-visited the field. It is still more inexplicable that his criticism should now be so largely a personal one.

Dr. Chalmers' ground for discrediting the evidences of the

glaciation of Mount Orford seem to be, 1st, that he did not see any himself; 2nd, that Professor Hitchcock—in short, like Cæsar's untrustworthy lieutenant, reported "*pro viso quod non vidisset*"; 3rd, that the writer, not being a glacialist, would not know what he saw, or be able to reason from it correctly if he did.

To the soft impeachment against himself the writer may be excused from reply. But to the suggestion that Professor Hitchcock reported what he did not see, it is only just to say that Dr. Chalmers omits to mention a very important part of that gentleman's observations. In order to remove any doubt as to the source of the boulders which he found on the higher portions of Mount Orford, Professor Hitchcock submitted a specimen for lithologic determination to Dr. F. D. Adams of McGill University, who found it to be a Laurentian erratic which must have come from the north side of the St. Lawrence river. Yet, Dr. Chalmers makes no reference to this in his criticism of Professor Hitchcock's article. Had he, on the other hand, exercised equal care to inform himself of the character of the loose rock material on the summit of the mountain, Dr. Chalmers doubtless would never have reached his present conclusion. Serpentine from the north-western base of the mountain, slates from the palæozoic rocks beyond, and Laurentian gneiss are so plentiful that any ordinarily careful observer cannot but see them. The soil which supports the scanty timber growth contains a large admixture of drift. A petrographic study of the mountain made by the writer a few years ago did not show a noticeably greater decomposition in surface specimens from the top, than from the base, of the mountain.

Therefore, until Dr. Chalmers has other evidence than he has yet adduced, the writer, while always open to conviction by information, must respectfully decline to accept his present views on the subject.

Yours respectfully,

JOHN A. DRESSER.

St. Henri de Montreal, May 17, 1905.

NATURE STUDY—No. XXIV.

APPARATUS REQUIRED FOR NATURE STUDY.

S. B. SINCLAIR.

It is often urged that "A Nature Study laboratory is necessary for the successful teaching of elementary science and that without expensive apparatus the work done will be of little or no value." If this view be entirely correct it is prohibitive as regards the introduction of Nature Study into the primary grades of elementary schools, for the general public are not likely to sanction any large expenditure for such a purpose. A brief investigation of this argument therefore may not be out of place.

Nature Study versus Laboratory Method.—The method of the laboratory is usually artificial, technical, abstract. In a laboratory experiment the conditions set up are different from the natural conditions and are established with the purpose in view of discovering or proving certain facts or laws by eliminating irrelevant factors and gaining control of others.

Now, a study of genetic psychology reveals the fact that, speaking generally, it is only when the child has reached the period of youth (beginning at the age of from 12 to 14 years) that the mind takes on the more reflective laboratory attitude which is interested in law, abstraction and generalization, seeks truth for its own sake, desires to probe into the hidden meaning of things and to develop technique in a scientific way.

Previous to this age and during the period of childhood (from about 6 to 12 or 13 years) when the child is in the primary classes of the Public School, the attitude is quite different. During this period the unity of interest is found in serial order, a relation of means and ends, a history or scheme. The child likes to observe the process from one stage to another and see how it is going to come out. He also finds his greatest pleasure in the development of skill in the attainment of some life purpose. It is a delight to him to find that he has gained a power to cause the process to come out differently from the way in which it otherwise would. He is not content with mere play as he was in the previous stage of infancy, but begins to look ahead, make plans for the future

and work for the achievement of his purpose, and he is willing to take considerable pains in gaining skill which will enable him to attain his end quickly and effectively.

With such an attitude the child naturally finds the laboratory work of the High School distasteful, but he takes to certain forms of Nature Study as instinctively as the duck to the water. The life-history of birds, trees and insects, the adaptation of each to its environment, the relation of each to his own life, the care of animals and plants—these and similar subjects, if presented in the right way possess an irresistible charm to him.

These characteristics of child-nature furnish a key to the material and the method of study which should be selected during those early years.

It may be noted in this connection that such study may be quite as scientific as laboratory work. If we accept the dynamic definition of Science as that which furnishes insight to interpret a new situation, we must admit that the child who intelligently and perseveringly studies the life history of a bird or plant and acquires skill in the control of the life process, is proceeding scientifically even though he never perform a laboratory experiment. Further, there is reason to believe that if the child omits such study during childhood when the impulse is at its height he will never again be able to atone for his neglect.

As the attitude, during this entire period constantly progresses toward the more thoughtful attitude of youth there should similarly be a constantly increasing emphasis upon the conventional side and particularly upon the development of skill. The need for such experimental investigation will be realized most readily by the child when there is a selection of material which lies very close to his own life interest, for example, the study of the effects of various kinds of food upon pet animals, of heat, light and moisture upon plants, or the humane extinction of injurious insects. These subjects may be treated from the functional standpoint without any tendency to commercialism. Such studies enlist the interest of the parent in the work of the school. They prevent and cure habits of vandalism and cruelty, and develop in the child a spirit of co-operation and helpfulness, which is the highest aim of education.

Character of Presentative Material.—As regards the materials of Nature Study, it may be noted in the first place that many of the models offered for sale are very poor substitutes for the original object. The study of the singing bird in its natural habitat is likely to prove a much more attractive and helpful exercise (especially with beginners) than the investigation of the mounted specimen or the inaccurately colored picture "11-17 of the original size." However, in some cases, after he has failed repeatedly to obtain a close and continuous view of the fitting object of his investigation, the learner turns to a study of the school model with a due appreciation of its special advantages. At the beginning, outdoor study is most valuable, and with proper preparation and care an occasional field excursion presents the best form of non-conventional Nature Study for the little child, and the most lasting results will be those gained from such outdoor study by the pupil without any immediate assistance from the teacher. Fields and woods are always accessible, the domestic animals, garden plants and flowers, birds and insects, the wonders of water, earth, air, forest and sky, are available in every locality, and all that is required is a sympathetic attitude toward nature, a genuine desire to investigate, and a few simple suggestions regarding the mode of procedure. I know a boy of 12 years of age who, with very slight preliminary instruction, has acquired a good working knowledge of all of our common local birds, their appearance, migration, nesting, song, adaptation etc., and has formed a close acquaintance with several of them. His interest in the subject is normal and wholesome, and his method of study quite ingenious, e. g., he never takes an egg except from a deserted nest and yet he has a fairly good collection. Making out-door investigation the starting point, the teacher soon finds that the children themselves bring specimens to the school for examination. Thus a collection of specimens for a cabinet is begun. As a rule children enjoy making collections, and there is a sense of proprietorship about such a possession which is a desirable factor and cannot be gained from bought specimens. The materials for definite study can very often be brought by the children, e. g., each child may bring a sample of the flower to be studied. There is no difficulty in securing a number of pet animals in a similar way.

For the highest type of work, books and other kinds of materials must be secured, but at the outset the cost will not be great, and these should succeed and not precede the collection of natural specimens. Under such conditions the purchased materials will be wisely selected, carefully studied and properly cared for.

Experimental Apparatus.—As has been pointed out, the experiments at this period are not of a vigorous analytic type, and consequently little apparatus is required, and that of a most elementary character, easily constructed by the teacher or pupil, or procured at trifling expense. A twenty-five cent lens may be of more value in such work than a compound microscope. The life-history of a plant, together with such phenomena as appeal to the child can be studied from a single specimen, the only expense involved being the cost of the seed and the crock. One of the most scientific and fruitful investigations of insects made in recent years is a study of ants, extending over six years, conducted by Miss Fielde of New York City, and reported to the members of the Philadelphia Academy of Natural Sciences. The following is a description of the apparatus used: "An ant nest can be made in an hour or two with two pieces of glass 3 in. by 4 in. and strips of Turkish towelling glued around for walls. A partition with a door is necessary to make a separate room for the food, a wet sponge in the living room, a few dead flies, and the home is quite satisfactory to your little guests. A sheet of orange tinted glass over the nest enables you to study them without any offensive publicity."

In no other subject is it so true as in Nature Study that "half a loaf is better than no bread." The teacher who waits for gilt-edged apparatus, a well-prepared school garden, a sympathetic public and other ideal conditions, will always find good and sufficient reason for postponing the introduction of the subject. On the other hand, the teacher who makes a wise selection of material, is content to begin with the day of small things and to make the best of the present situation, will find that in Nature Study, as in every other activity, "Perfection consists not in a having and a resting but in a growing and a becoming."

JULY, 1905.

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CONTENTS.

	PAGE
1. A Naturalist in the Frozen North, by Andrew Halkett...	79
2. Bird Notes	87
3. General Excursion to Chelsea	88
4. General Excursion to Carp ..	91
5. Nature Study—No. 25, by C. W. G. Eifrig ..	95

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Three of a flock of five albino Shovellers taken Sept. 3rd, 1904, by ALEX. CALDER, 50 miles S. W. of Calgary, Alta.

THE OTTAWA NATURALIST.

VOL. XIX. OTTAWA, DECEMBER, 1905.

No. 9

ON SO-CALLED *SILENE MENZIESII*.

BY EDWARD L. GREENE.

The original specimens of what Sir William Hooker in his *Flora Boreali-Americana*, published as a rather dubious member of the genus *Silene*, under the name *S. Menziesii*, were from the shores of Puget Sound. Within the hundred years and more that have passed since Menzies gathered this, plants of just this type have been collected from almost every part of the western half of North America, and all the way from the humid seaboard woods and hills to the banks of little streams coursing down the slopes of desert mountains in the remote and arid interior of the continent; from the level of the sea to near the alpine summits of the Rocky Mountains and a thousand miles inland. No type of higher plant life remains specifically one and the same throughout so vast a range, and so great a diversity of geological and climatic conditions; and, quite as we should expect, these inland plants from one region and another, differ both from the original type, and from one another so widely and variedly that no unbiased mind would ever regard them as being all one *Silene Menziesii*. A low almost matted one from Idaho, at a point 8,000 feet above the sea, looks like Chickweed; another from 11,000 feet in Colorado, looks more like *Arenaria lateriflora*, while a third away up in Assiniboia resembles one of the most upright and delicate of *Stellarias*. A prolonged and careful study of the material of this kind now extant in the larger herbaria has made the distinguishing of eighteen species of this aggregate a necessity; and the characters of them have lately been given in Volume One of my *Leaflets*. The group is out of all harmony with *Silene*, as even Hooker felt, when he had but the one species in hand. It is every way more like either

Arenaria or *Stellaria*, except that the capsule alone is that of *Silene* rather; and I have named the genus *Anotites* in allusion to the absence of those ear-like appendages of the petals seen in *Silene* and in many another allied genus.

The herbarium specimens of the Canadian Geological Survey have been of great service in this study, and about four of the species already described are known to me only as in that collection, and as belonging to the Canadian side only of the International Boundary. That list is now raised to five by virtue of a new one more recently collected by Mr. Macoun, *A. picta*, the first account of which is herein published. With the description of this, I have thought it well to give the essential characters of all the Canadian species as I at present understand them; appending to such a key to the species, the notes of habitat furnished by the labels in the herbarium.

*Stems nearly upright, not slender.

Internodes 1 1-2 to 2 inches long, the lower retrorse-villous, the upper with spreading gland-tipped hairs; leaves as long as the internodes, elliptic lanceolate, acuminate *A. Menziesii*.

Internodes hardly an inch long, all devoid of gland-tipped hairs and retrosely pubescent: leaves short and broad, not acuminate but cuspidately acute..... *A. latifolia*.

* * Stems upright, slender.

Stems terete, almost glabrous below, above glandular-hairy: leaves narrowly elliptical; cyme open, leafy: calyx-teeth detoid-ovate, abruptly acutish. *A. tereticutis*.

Stems 4-angled, below retrosely villous, above with gland-tipped hairs. leaves oblanceolate to elliptic, very acute: calyx-teeth triangular-lanceolate, acute..... *A. tenerrima*.

* * * Stems lower, decumbent or even diffusely branched.

Stems terete, sparsely leafy, below scantily retrorse-pubescent, above glandular-hairy only: leaves elliptic-lanceolate, acute; flowers in an open leafy-bracted cyme: calyx-teeth triangular-subulate *A. picta*.

Stems 4-angled, very leafy, all the pubescence glandless and retrorse: leaves lanceolate or lance-linear, very acute..... *A. debilis*.

A. MENZIESII (Hook.) Greene, Leaf. i. 98. Along the seaboard and western slope of mountains generally in British Columbia, Oregon and Washington; also apparently in Northern Idaho. Almost the longest species, and with long pointed foliage commonly spreading, when well mature, having flowers and capsules in an ample cyme.

A. LATIFOLIA, t. Greene, l. c., known only from woods about

Yale, B. C., as collected by Mr. Macoun, Geol. Sur. N. 61,314, Under ground growth apparently different from that of *A. Mensiesii*, and the leaves short, broad, not long-pointed; flowers few, not cymosè but scattered in the axils of leaves.

A. TERETICAULIS, Greene, l. c. 105. Of this I know but a single specimen, Herb. Geol. Surv. n. 10,123, from Waterton Lake, Alberta, 1895, by Mr. John Macoun, but the characters of the species are excellent, the stems with no trace of angularity, and openly dichotomous from the middle, the inflorescence therefore ample, but leafy.

A. TENERRIMA, Greene, l. c. 104. This is remarkable for extremely thin vivid green foliage, and the whole plant, even to the 4-angled stems is very slender and delicate, the scattered flowers on the most slender of pedicels in the axils of the leaves. Notwithstanding its slenderness and delicacy the plant appears to be upright. The specimens are from Medicine Hat, Assiniboia, by Mr. Macoun, June, 1904, the fine herbarium sheet being numbered 3,090.

A. DEBILIS, Greene, l. c. 101. A low small depressed and much branched herb., nearly as delicate as the last, as different as possible as to mode of growth, the angles of the stem almost uncinatè-prickly in a very delicate fashion, the very lowest internodes somewhat villous downwards. The species is another of Mr. John Macoun's gathering in Assiniboia, June, 1895, from Farewell Creek in the Cypress Hills, the number, 10124.

A. PICTA, sp. nov. Loosely tufted, ascending 8 to 10 inches high, the stems terete, dichotomous, leafy and floriferous from below the middle but loosely so, the internodes often of more than twice the length of the leaves, the lower with a minute and scanty retrorse pubescence, the upper and the pedicels with as minute but more copious and spreading gland-tipped hairiness: larger leaves little exceeding an inch in length, spreading, elliptic-lanceolate, very acute, sparingly and retrorsely scabro-pubescent on both faces: reduced leaves of the cyme ovate-elliptic, the pedicels short, the lower not exceeding the leaves; calyx small, oval, the triangular-subulate teeth erect or connivent and wholly red-purple: petals small.

Hector, B.C., 4th Aug., 1904, J. Macoun, Geol. Surv., n.

64,707, the type. This species bears a remarkable likeness to the common chickweed as that appears in its later and fructiferous development. It is akin to *A. alsinoides* of Idaho, yet very distinct.

AN ALPINE VARIETY OF *CNICUS MUTICUS*.

By M. L. FERNALD.

Cnicus muticus of our eastern swamps and low woods is a tall loosely branched plant with numerous scattered heads, the involucre of which are whitened with dense cobwebby hairs. This plant is frequent in southern New England, and in the more northern States and adjacent Canada it becomes one of the conspicuous elements of lowland vegetation.

On the alpine tableland of Mt. Albert in the Shickshock Mountains, a low simple-stemmed *Cnicus* abounds in boggy spots. Ordinarily only 3-6 dm. tall and very strict, with the 3 to 5 showy heads sessile in a terminal glomerule, the plant suggests at first sight some species very remote from the tall loosely branched *C. muticus* of low altitudes. In its dark purplish-green nearly glabrous involucre the plant is likewise quite different from typical *C. muticus* with its strongly white-arachnoid bracts.

On Mt. Albert the plant, as stated, is strict and low, but when it occasionally descends from the alpine tablelands and follows the rivers which have their sources in the Shickshock Mountains it becomes very tall. Thus, in alluvial thickets of the Little Casapedia River the plant, retaining its simple habit and glomerulate heads, becomes 1.6 m. high. As far as known to the writer this characteristic plant is confined to a limited area in eastern Quebec, where it is usually constant to the peculiar characters described. Occasional plants from adjacent territory are similar in habit but with the involucre quite as arachnoid as in typical *Cnicus muticus*. On this account and in the absence of any constant character in the foliage or in the form and texture of the bracts the plant should be considered an extreme variation of the widely distributed *C. muticus*, and on account of its great development in the alpine regions of Mt. Albert it may be called

CNICUS MUTICUS (Michx.) Pursh, var. *monticola* var. nov. Caule

simplice stricto fere 3-6 dm. alto; capitulis 3-5, glomerulatis; involucris companulatis, squamis glabris vel glabrescentibus. QUEBEC, boggy tablelands, altitude 900-1,000 m., Mt. Albert, Gaspé Co., August 12th, 1905 (*Collins & Fernald*). Tall plants, becoming 1.6 m tall, from alluvium of the Little Cascapedia River, July 29th and 30th, 1924 (*Collins, Fernald & Pease*) probably represent var. *monticola* washed down to richer soil and more favorable surroundings.

Gray Herbarium, Harvard University.

A NEW GOLDENROD FROM THE GASPÉ PENINSULA.

By M. L. FERNALD.

While ascending the River Ste. Anne des Monts in Gaspé County, Quebec, Prof. J. F. Collins and I found in the gravelly alluvium of the river, about midway between the sea and the Forks, scattered plants of a handsome and to us quite unfamiliar *Solidago*. The occurrence of the plant only as isolated specimens, amongst the everywhere abundant *Solidago elongata*, on the floodplain of the river, suggested very strongly that it had washed down from one of the alpine tablelands or ravines of the Shick-shock Mountains, and we naturally hoped soon to find the real home of the goldenrod. This hope was encouraged by our finding near by and under similar conditions isolated plants of *Arabis alpina*, *Lychnis alpina*, *Vaccinium ovalifolium*, and various other species which we knew to abound in certain regions of the Shick-shocks.

Such exploration as we were able to carry out in the mountains, however,—the study of a limited portion of Mt. Albert—showed us only two alpine goldenrods, *Solidago multiradiata* Ait. and *S. decumbens*, Greene, both abundant in their respective areas, but clearly distinct from the plant seen in the valley below. This plant, known as yet only from the valley of the River Ste. Anne des Monts, is apparently a unique species of the *Thyrsiflora* nearest allied to *S. multiradiata* and the anomalous plant described by Dr. Gray from the Mogollan Mts, in New Mexico, as *S. multiradiata*, var. *neo-mexicana*. From the former polar species which abounds

on Mt. Albert the plant is quickly distinguished by its narrow elongate thyrsus and bright yellow involucre bracts as well as by numerous other characters. In habit it is a close match for *S. multiradiata*, var. *Neo-Mexicana*. That plant, however, has the cauline leaves more prominently toothed and the firmer greener bracts of the involucre distinctly pubescent along the back, while the bright yellow bracts of the Gaspé plant are thin and glabrous.

I have been unable to find any mention of a plant which seems specifically identical with the yellow-bracted plant of the River Ste. Anne des Monts, which in recognition of its unusual involucre character I propose to call

SOLIDAGO chrysolepis sp. n. Caule erecto simplice glabro apice setuloso-piloso ; foliis coriaceis, inferioribus spatulatis apice rotundatis petiolatis crenato-serratis, caulinis remotis elongato-oblongatis acutis subintegris vel rare serratis, superioribus lineari-lanceolatis ; capitulis in thyrsum spiciformem confertis ; involucri campanulatis, squamis flavis glabris acutis margine ciliolatis medio glutinosis ; floribus 12-16, ligulis 6-8 ; achaeniis setulosis.

Plant 5-6.5 dm. high, the erect simple reddish stem glabrous below, sparingly setulose-pilose above, especially in the inflorescence : leaves leathery ; the basal and lower cauline spatulate, with rounded tips, petioled, crenate-serrate, 12-18 cm. long, 2-3.5 cm. broad ; the few (3 to 5) remote cauline ones elongate-oblongate, acute, subentire or slightly serrate, 7-17 cm. long, 1-2 cm. broad ; the floral linear-lanceolate, only the lowermost conspicuous : inflorescence a virgate or spiciform compound thyrsus, 2-4.5 dm. long, 4-6 cm. thick, the branchlets setulose-pilose : heads mostly slender-pedicelled, in anthesis spreading or nodding, later becoming suberect : involucre campanulate, 5-6 mm. long : bracts 12 to 15, in 3 ranks ; the outer bluntly acute ; the inner attenuate, acute ; all bright yellow, with a narrow glutinous darker middle, glabrous except the obscurely ciliolate margin : ray- and disk-flowers each 6 to 8, orange-yellow : achenes slightly broadened above, setulose.—QUEBEC, gravel-beach of River Ste. Anne des Monts, August 5th, 1905 (*J. F. Collins & M. L. Fernald*).

Gray Herbarium, Harvard University.

SOME NEW LOCALITIES FOR CANADIAN LAND AND
FRESH-WATER SHELLS.

BY J. F. WHITEAVES.

These localities are new only in the sense of not having been previously recorded, as the specimens from some of them were collected many years ago. All the shells referred to in this paper are in the Museum of the Geological Survey of Canada, and the species with an asterisk prefixed to their names were kindly determined by Dr. V. Sterki.

PELECYPODA.

Sphaerium simile (Say.)

Knee Lake, Keewatin, O. O'Sullivan, 1905; one adult specimen. Lievre River, Que., at High Rock, Rev. C. W. G. Eifrig, 1905; several specimens. Vermilion River, northern Alberta, J. B. Tyrrell, 1886; one perfect and full grown specimen.

**Sphaerium crassum* ? Sterki.

McLeod Lake, head waters of the Peace River, west of Pine River Pass, B.C., G. M. Dawson, 1879; three good specimens. "These resemble most *S. crassum*, but are slightly different from the typical form and larger. I know of no other published species to which they could be referred, though I have a *Sphaerium*, which is probably undescribed and under which they may range, from a number of States." Sterki.

**Sphaerium stamineum*, Conrad.

Lake Erie, at Port Colborne, Professor John Macoun, 1885; thirteen specimens. Abitibi Lake, W. J. Wilson, 1901; seven specimens.

Sphaerium occidentale, Prime.

Thames River at Woodstock, Ont.; and marsh near Lake Ontario at Leamington; John Macoun, 1892. Hector, B.C., at an altitude of 5,300 feet; and crossing of the Columbia River at Revelstoke, B.C., John Macoun, 1890. A few good specimens from each of these localities.

**Sphaerium Walkeri*, Sterki.

Head waters of the Chibougamman branch of the Nottawa River, Northern Quebec, A. P. Low, 1905 ; four "living" and perfect specimens.

**Sphaerium (Musculium) Raymondi*? J. G. Cooper.

Head waters of the Columbia River at Upper Columbia Lake, B.C., J. B. Tyrrell, 1883 ; two specimens.

Pisidium Idahoense, Roper.

McLeod Lake, Peace River drainage system, B.C., G. M. Dawson, 1879 ; one specimen.

**Pisidium Roperi*, Sterki.

Peat bog near middle branch of Old Man River, Alberta, J. B. Tyrrell, 1883 ; eighteen specimens.

**Pisidium Mainense*, Sterki.

Jupiter River, Anticosti, John Macoun, 1884 ; twenty-six specimens. "Generally somewhat less characteristic in shape than specimens from Maine and Michigan." Sterki.

GASTEROPODA.

Amnicola emarginata, Kuster.

Mouth of Red River, Manitoba, J. H. Panton, 1884 ; several specimens. Shell River, Manitoba, J. B. Tyrrell, 1887 ; two specimens.

Ancylus parallelus, Haldeman.

Chartron's Island, Aylmer, Que., L. M. Lambe, 1889. eight specimens ; and Root River, Keewatin, W. McInnes, 1905, one specimen. Lost Lake, Comox, V.I., John Macoun, 1887, two specimens ; and Burrard Inlet, B.C., John Macoun, 1889, seven specimens.

As *A. rivularis*, Gould, is "considered by Haldeman to be this species and not Say's *A. rivularis*," it may be that the Montreal specimens that Dr. B. Bell identified with *A. rivularis* in 1859, are *parallelus*.

Ancylus tardus, Say.

Crane Lake, Assiniboia, John Macoun, 1894 ; eighteen speci-

mens of a shell which Mr. Bryant Walker regards as a "large western variety" of this species.

Pupilla muscorum (L.)

Mouth of Jupiter River, Anticosti, John Macoun, 1884 ; abundant on logs. East side of the Cypress Hills, Assiniboia, John Macoun, 1894 ; several specimens.

**Vertigo modesta*, Say.

Kananaskis, Alberta, John Macoun, 1885 ; several specimens.

**Vertigo ventricosa*, Morse.

Riviere du Loup (en bas), Quebec ; two specimens.

Sphyradium edentulum (Draparnaud).

Swamps near Tobacco Plains, Kootenay River, B.C., J. B. Tyrell, 1883 ; four specimens. Kananaskis, Alberta, John Macoun, 1885 ; several specimens.

THE GEOLOGICAL SOCIETY OF AMERICA.

The Eighteenth Annual Meeting of the Geological Society of America, made up of Fellows from various countries of this Western Hemisphere, but chiefly from the United States, Canada and Mexico, is called for Wednesday morning, December 27th, 1905 and will last three days. The officers of the Society for 1905 are as follows :

President: Raphael Pumpelly, Newport, Rhode Island ; Vice Presidents : Samuel Calvin, State Geologist, University of Iowa ; and Prof. W. M. Davis of Harvard University, Cambridge ; Secretary : Prof. H. L. Fairchild, University of Rochester, N. Y. ; Treasurer : Dr. I. C. White, Morgantown, West Virginia ; Editor : J. Stanley-Brown, New York City ; Librarian : Prof. H. P. Cushing, Western Reserve University, Cleveland, Ohio ; Councillors : H. M. Ami, Geological Survey, Ottawa ; John M. Clarke, State Geologist, Albany, N. Y. ; Prof. J. F. Kemp, Columbia University, New York City ; Prof. G. P. Merrill, U. S. National Museum, Washington, D. C. ; Prof. R. D. Salisbury, University of Chicago.

The circular of information, issued by Secretary Fairchild to all the Fellows, refers to the details of arrangements for the meeting here, including facilities regarding customs as well as railway and hotel accommodation, usually given to the Fellows of the Society, announces a Council meeting for Tuesday evening, Dec. 26th at the Russell House, selected as Headquarters during the meeting. Through the courtesy of Dr. White, Principal of the Provincial Normal School, the Assembly Hall and adjoining rooms of this institution, five minutes' walk from Headquarters, have been placed at the disposal of the Local Committee on behalf of the Society, for the forthcoming meetings, and these are in every way suited for the purpose.

Lantern and other facilities for illustrating papers to be read before the Society have been provided.

Through the kindness of the Commissioner of Customs of Canada all packages, specimens, charts or documents intended, or serving, to illustrate papers read and presented at the Geological Society's meeting will be admitted *free* of duty.

A large attendance is expected at this meeting as many have already signified their intention of being present. A local Committee has charge of details for the Meeting. The evening sessions, when the work of the day is over, promise to be of an interesting nature. To relieve the burden of the day-work a couple of functions have been arranged for already and the Annual Dinner of the Society will be followed by a Reception at which His Excellency the Governor General will be present. The Premier, Sir Wilfrid Laurier, the Hon. Mr. Oliver, Minister of the Interior, and head of the Geological Survey Department, as well as other Cabinet ministers in the Capital are also expected to be guests at the dinner.

The meetings partake of an international character and the Public Lecture to be given on Thursday, Dec. 28th, will be on 'The preservation of Niagara Falls'—a subject of deep interest to all North American citizens.

The following order of events has been practically decided for the evening entertainments :

(1) Presidential address : Prof. Raphael Pumpelly. To be given in the Russell House parlour. Followed by a smoker.

(2) Public Lecture : Dr. J. M. Clarke, State Geologist, of Albany, N.Y. Subject : "The Conservation of Niagara Falls." In the Assembly Hall of the Normal School, Lisgar street.

(3) Annual Dinner of the Society, Russell House, followed by a Reception, when Their Excellencies the Earl and Countess Grey and other citizens will be present.

EXTRACTS FROM THE DIARY OF THE LATE ROBT ELLIOTT.

The whole of the life of this lovable naturalist was lived three miles east of Bryanston, near the banks of the Thames River. For him every occurrence in nature had its interest, and his acquaintance with the different branches of Natural History was that of the thorough student, no person in his district being so well acquainted with so many branches of Natural History as he. His death at the early age of 44 was a great loss to his friends rather than to the public, as he could seldom be induced to write anything upon Natural History for publication, always demurring on the ground that his knowledge of the subject proposed was too limited.

Some of his many poems have been published in local papers, such as the Farmers' Advocate and the London Free Press, and after his death a small volume of selected verses was printed in London. His health was never robust and the pressure of other duties often prevented him from keeping up his Natural History studies and notes as thoroughly as he might otherwise have done, but there is much of great interest in his diaries, relating mostly to Botany and Ornithology, though also touching on almost all the other branches of Natural Science. These notes are now in the hands of Mr. W. E. Saunders of London under whose selection portions of them are to be published in the columns of the OTTAWA NATURALIST.

April 3, 1887. Heard the first Hyla. Saw Towhee (for the first) two males. Yesterday (Sunday) was a typical spring day, the sun shining—the snow rapidly melting—a soft south wind

blowing—birds singing—frogs croaking, etc. Today is somewhat different. In the forenoon cloudy with a strong west to northwest wind blowing. Tonight, 9 P.M. we are having a veritable blizzard, colder, with snow. What of the birds? The Phoebe that chirped this mornig on the barn, or the Robin that sang on the Lombardy poplar at the gate?

April 8. Saw large numbers of *Branchippus stagnalis*, in pools, also caddis-fly larvæ in their curious cases in the same location. Some, perhaps seventy-five per cent, of the cases were made of fine twigs and pieces of grass crossed, the balance was formed of the bark of dead twigs with the wood removed—the larvæ occupying the interior. All appeared alike, head with strong jaws and three pair of legs.

April 14. Saw a Great Horned Owl with three Red-tailed hawks assaulting it; when a dozen or so of crows came to help along the fight the hawks retired. The owl kept low, not more than twenty feet from the ground each time it alighted; twice I saw it in the crotch of a small tree crouching beside a limb, and with tail and wing slightly separated it looked so exactly like a dead branch of a tree hanging there that without knowing for a certainty that it had settled there I would not have suspected its identity. I approached twice within fifteen feet and had an excellent view.

Last Sunday (10th) J. E. saw a racoon that the dog caught as it was attempting to climb a tree. The animal was so poor after its winter fast that it could scarcely stand and was quite unable to climb. The dog did not hurt it and J. E. caught a frog which it ate in presence of the dog.

May 19. Saw Wodchuck in a bare field. When hard pressed he lay flat on the soil and remained motionless; when disturbed his teeth were ground in a very threatening manner. We let him go and he left for the nearest fence working his teeth all the time and displaying to their fullest the hairs on his tail.

June 2. Found nest of Junco in grassy place at edge of woods; placed beneath the half of a hollow log completely covered, with entrance a foot from nest at end of log, contents four young Juncos and one Cowbird. Nest composed of weeds bark strips lined entirely with dry grass leaves.

June 5. Found nest of Redstart among young maples at Model Farm, placed in fork of sapling seven feet from the ground; composed outside of weathered vegetable fibre, inside fine grass stalks, rootlets and a few hairs, contents three Redstart eggs and one Cowbird's, incubated about two days. The latter egg was sunk more than half way down the bottom of the nest and would not likely have been successfully hatched.

March 4, 1888. Dark, cold and dreary. Wind north or northwest, snowing a little A.M., darker P.M. Winter Wrens singing. Brown Creepers and Golden Crested Kinglets very common. From appearances, today may be taken for mid-Nov. ember. A close glance, however, reveals many reassuring signs of the revival of nature. In the woods innumerable mottled leaves of *Erythronium* are boldly pushing through the withered relics of last year's vegetation; *Jeffersonia* is daringly lifting her delicate looking flower buds beside the pond; and in sheltered nooks, reptiles, etc. are freeing themselves from winter's iron grasp.

March 24. Cold and clear. Saw two Pileated at edge of woods not far from house. One would cackle and the other would start the echoes with a ringing caw. They looked very fine, the setting sun striking their brilliant scarlet crests.

April 27. Young Shore Larks on the wing. Saw Water Thrush feeding in shallow water in willows. How quickly nature responds to the warm invitation of the sun. Today plants are springing up in every nook and cranny. *Podophyllum* is lifting its umbrella to shelter its wax-like blossoms from the glare; *Dicentra* will soon hang her ear drops in the fresh air; *Claytonias* are out in all their modesty and sweetness; *Hepaticas* are very common and already *Erigenia bulbosa* is setting her tiny seeds. Good bye, dear little harbinger of Spring, well have you fulfilled your mission.

April 27. The summer Warbler is singing cheerily from the willows and cherry trees today for first. Young Shore Larks on the wing. Saw Water Thrush feeding in shallow water among willows. How quickly Nature responds to the warmth.

May 2. Hoar frost last night. Morning clearing and

warmer. Pileated at nest, doing what, I can hardly say. Nest is apparently finished, if not, work is going on in a desultory fashion.

May 3. Saw Pileated at nest 5 P.M. Half an hour later saw a Redhead chasing Pileated round and round. Saw six species of Woodpeckers today including Red-bellied.

May 4. W. R. Shrike's nest in *Crataegus* at Hardy's. Nest 9 ft. from ground, 3 ft. from trunk, on horizontal limb with numerous upright twigs, composed outwardly of twigs, strips of bark, wool, strings, and thistle down, lined inside with wool, feathers and a few horse hairs. Contents, six fresh eggs. Male was feeding female on nest when I approached.

May 9. Pileated is seen more frequently around nest. Dug up two specimens of *Cambarus diogenes* from bottom of ditch, placed in a sort of pocket or cell at water line. Found Blue Jay's nest in *Tsuga Canadensis* fifteen feet from ground and ten feet from trunk, on bank of river. First specimens seen today of Black-throated Blue and Black-throated Green warblers, Red-start and King-bird. Saw Cricket for first.

May 18. Cold and wet. Found beneath rotten log in swampy woods a Salamander, length 6 inches. Color dark brown or smoky black, body, back, sides and tail blotched with blue spots. Tail sticky. When placed in spirits it exuded a considerable quantity of milky fluid, mostly from tail. (A Jeffersonianum.)

May 21. Beneath a rotten log in bush found a Salamander $5\frac{3}{4}$ inches long, same situation of one of 18th. Color greyish brown, with rather large quite distinct yellow spots. Near the same place found a smaller Salamander $4\frac{1}{2}$ inches long. Similar in markings to the one of the 18th. On irritating it with a twig it exuded a considerable quantity of a milky fluid from the blotches on the tail. This fluid was extremely sticky.

Found beneath a rotten log in dry beech woods a small Shrew, No 20, length 3 inches, tail $1\frac{1}{2}$, color greyish brown, ears large and open. Long hairs on nose, eyes small. A small tuft of bristles on end of tail. Ate two angle worms and one May bug, then died in bottle.

May 23. Saw Blue Jay's nest in grape vine, underneath veranda at H. H's, four feet from door and exactly opposite to it.

People going in and out every day. Contents, two very young birds and one egg.

May 26. Visited Pileated's nest by means of ladder. About 32 feet from ground. Found young birds in nest. Believe it was occupied last year and intend watching next year in same place.

May 27. About 7 P.M. saw two very large flocks of birds flying north and making a sound like young dogs; probably a species of gull.

May 29. Very warm. At Calamus Point saw two water snakes slip into the water. Captured one and placed it beneath stone on the flats.

May 30. Went for water snake and found it collapsed. It was about 25 inches long. Captured a small one near the same place, alive, and brought it home. It proved to be *Tropidonotus leberis*, Leather snake.

May 31. Found water snake of same size as the first one. The five individuals of this species that I have seen during the last three days were all in moderately deep water—18 inches, among large stones, and in a steady current. One of them settled in the bottom among some decayed plants and seemed inclined to stay there; the others all appeared unwilling to remain underneath the surface for any length of time; all coming to the surface quite close to me at intervals of about three minutes.

They are easily captured and are apparently quite docile. The large ones are darker and the lines on belly are not nearly so distinct as in the smaller ones.

June 6. At Gough's, 6th Con. took set of five nearly fresh eggs of *Accipiter velox*, Sharp-shinned Hawk. Nest was situated in dense Arbor Vitæ swamp, twenty feet from ground, built on a number of small branches; a large collection of twigs of Arbor Vitæ and Larix, mostly the latter; an oblong pile, a foot thick and running half way around the tree. Nest placed on top of one end of the structure. Eggs fresh or nearly so. Bird remained on nest until I got within a few feet; flew off but remained near and was clearly identified.

June 7. A Hairy Woodpecker has come regularly once or twice a day until very lately to an oak post near Gough's door, on

which is placed a strand of wire. He drums on this and the effect is quite musical.

July 10. Fine. Up to Model. *Cypripedium spectabile* with twenty-four decayed blossoms on it in swamp. Tried to imagine how pretty it must have looked in its prime. Five young Ruffed Grouse rose from the sedgy swale nearby—a spirited lot. Crossed the river to gather some Sweet Flag, then passed further north to see *Nuphar advena* lifting their golden crowns to the sun. How exceedingly beautiful this plant is when closely examined.

July 26. Last summer found a plant in seed, in blue clay and gravel at the edge of Plover Pond; name unknown. Sowed the seeds in garden. In bloom today—proves to be *Lampsana communis*—Nipplewort.

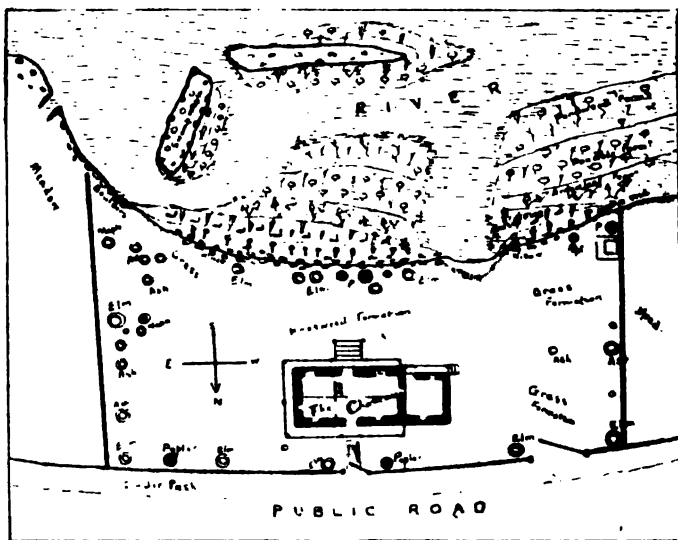
TWO RARE FUNGI.

Two very interesting fungi were recently sent for determination to the writer and Dr. James Fletcher, by Mr. Henry Johnson of Simcoe. Neither of us having seen these species before they were submitted to Mr. E. A. Burt for his opinion. One he identifies as *Cyclomyces Greeni*, Berk., the other as *Pleurotus subarcolatus*, Peck., both very rare species and not before recorded from any point in Canada, so far as we know. The *Cyclomyces* was found found by Dr. W. A. McIntosh a short distance from the village of Lynnville, in Norfolk Co. It was growing on the ground among some rotten wood, but whether on the wood or in the soil Dr. McIntosh could not say. The *Pleurotus* was found by Mr. Johnson "in Lynnwood Park in the town of Simcoe. It grew on a small maple tree which stood among a clump of trees. Something had taken the bark off one side of the tree and the exposed part had decayed somewhat and here the fungus was growing."

NATURE STUDY No. XXX.

NATURE OBSERVATIONS AT HOME.

By Prof. W. LOCHHEAD, Biologist, Macdonald College, St. Anne de Bellevue, Que.



The observations and suggestions for study indicated in this article have special reference to a well-known property on the banks of a well-known river. This plot of ground, however, is not very unlike other plots of ground, and similar studies may be carried out in nearly all home grounds, more especially those that border on lakes, rivers or smaller streams. By referring to diagram, one will note that the property lies between the public road and the river; that there is a large number of middle-sized, shade-giving trees, most of them along the borders of the lot; that a stone house stands near the middle of the grounds; and that the shallow shore is fringed with plants, while farther out are two small islands, fringed also with plants standing knee-deep in the water.

It may be observed, also, that the property stands at the head of a little bay, or bayou, of the river, where the currents are

not as strong as those farther out, and which the sediment and silt are rapidly filling up. The two small islands stand at the mouth of this bayou and have been formed as bars by the currents of the river.

The white-washed stone house is the first object to attract the eye of a casual visitor, for it has a peculiar appearance, characteristic of many of the old French Canadian houses seen in many parts of the country. Its stone walls are nearly three feet thick, its long concave roof projects far beyond the walls to form the covering of the verandah, and its upper dormer windows stand out half-way up the roof. It was built more than one hundred and fifty years ago, and its age should of itself invite questions. Locally the house is known as "The Chateau," and has been for several generations the homestead of a large French Canadian farm.

The large number of medium-sized trees with abundant foliage make this property a delightful place during the hot days in summer. Unfortunately, no evergreens had been planted by the former owners, so there is little or no protection in the winter from the cold, penetrating winds. The trees were likely planted at different times, for the slow-growing white elms are almost as tall as the more rapid-growing white ashes, soft maples and cottonwoods or poplars. Here are good opportunities for a comparison of the habits of these common trees:—their general appearance from a distance, their manner of branching, their bark, their leaves and leaf arrangement, their fruits, and also their insect and fungous enemies, etc.

Perhaps the most interesting plants flourish in the shallow water along the river bank. There the plants are plainly grouped into formations, or zones, running parallel with the shore, each characterized by certain dominant species. For example, on the low bank are low willows and swamp maples; nearer the water, yet on the sandy beach, are joe-pye weed, clodes and water horehound. In the water along the shore are sweet-flags, cat-tails, bulrushes and arrow-leaves; in deeper water are pond lilies and Indian rice; and in yet deeper water are the pond-weeds and bass-weeds (see diagram where each zone is called after its dominant plant). Such a shore plant-society deserves and well repays care-

ful study, for it is evident that its members must possess special adaptations for such an aquatic life. What are some of these adaptations? In the first place, we observe that most of them are perennial, and have well-developed rootstock systems in the loose soil below the surface of the water. From the rootstocks arise vertical branches bearing the leaves and flowers. Again, the tissues of such rootstocks are spongy in texture, and contain many air cavities, for some provision must be made for the supply of oxygen requisite for the respiration of the living cells. Moreover, the stems have but little need of mechanical woody tissue on account of the buoyancy of the water, or of cork because the plant is compelled mainly to absorb its food directly through the walls in contact with the water.

The leaves of these aquatic plants are also adapted in many ways to the medium in which they live. The floating leaves are oval or shield-shaped, as is the case with the pond-lilies; while the submerged leaves are either dissected or ribbon-like, as in some pond-weeds, water-milfoils and water butter-cups. Often the under surface of floating leaves is purple to absorb as much of the heat as possible. The arrow-leaves have peculiar arrow-head shaped leaves, but occasionally one finds submerged forms that are grass-like.

The reproduction of these plants is interesting. The flowers are all borne on or above the surface of the water, and the pollen is carried by winds, currents of water, or by insects in the case of conspicuous flowers like the pond-lilies. Moreover, the seeds of most of these plants are able to float on account of the presence of air cavities, and are scattered by currents. Bud propagation also is very common. Special buds containing much food drop off into the mud and develop into new plants the following season.

Further, it will be observed that the intricate net work of upright and horizontal branches at the edge of the water collect silt and entangle fallen dead plants. In a short time the mud accumulates to such an extent that the water becomes sufficiently shallow to allow flags and rushes to develop and oust the former owners. These in turn will give place to joe-pye weeds and willows, and so the struggle goes on for possession of the shallow waters and an extension of the shore.

Here are a few additional questions relating to water lilies which the nature student should try to answer. In what respects are the leaves, flowers, and rootstocks of the white and yellow water-lilies alike? In what respects do they differ? What is the function of the air-canals in the petioles and peduncles? Why is the upper surface of the leaf waxy? Determine on which surface of the leaf the stomates or breathing pores are placed. Do the submerged rootstocks bear leaves? What hold the rootstalks at the bottom? Account for the numerous scars on a rootstock. What is the color of the rootstock? In what part of the rootstock are the strengthening tissues located? What differences in the habits of the flowers of the two species? What changes occur to the pistil when it is mature? What insects visit the flowers? What are the insect enemies of pond-lilies?

Other plant formations may be studied in the ground around the house. At the back door where there is abundant nitrogenous waste are knot-weeds, lamb's quarters, chickweeds, large-leaved plantains, burdocks, ragweeds, shepherd's purse, docks, and nettles. All are hardy, quick-growing, and prolific in seeding.

Here again are special adaptations. The stem of the large-leaved plantain is actually pulled down a short distance into the ground by its many contractile roots, and the plant is better preserved from injury than if it lifted its stem into the air. The chickweed leaves have lines of hairs which direct the rain which falls on them down the stem to the roots. The pointed leaf of the nettle, on the other hand, directs the rain away from the stem, and allows it to drip from the tips of the outside leaves to the ground. The roots of the nettle spread widely, and the rain falls where it will be most refreshing. The docks and burdocks have deeply penetrating roots, and they seldom suffer from lack of moisture.

Beneath the trees the plants are mainly blue grasses. There the vegetation is so rank and close that other plants have but little chance to make headway. Sometimes rib-grass, yarrow, and ox-eye daisy establish themselves, but these, it will be noted, have leaves either narrow like the grasses themselves, or dissected so that they can compete with the grasses. The grass leaf shows an adaptation to rain. When rain falls the water running down the

leaf is prevented from passing within the leaf sheath by the ligule, the small scale at the junction of leaf and sheath.

Much could be learned about the insect life of *The Chateau*, but space will allow only a brief notice of a few forms, not to mention the always interesting common white and sulphur butterflies, the swallow-tails, the red-admirals, fritillaries, meadow-browns, and the bluets, which flit here and there and from meadow to meadow, or the bees, wasps, flies and beetles which are on the flowers at the water's edge. Many yellowish maggot leaf-miners inhabit the leaves of joe-pye weed and feed on the soft tissues between the two outer layers.

Plant-lice are abundant on the stems of some of the plants. Those that cluster on the stems of lamb's-quarters are of a greenish color, those on the Canada thistle black, and those on small Balm of Gilead spotted. Ants, too, are there feeding on the sweet honey-dew secreted by their "cows." Small caterpillars form nests on the umbels of the wild parsnips by drawing the flowers together with silken webs, and large black-and-white, plumed caterpillars feed on the leaves of the ash trees, and often make themselves too friendly when they drop from the leaves to the hats and coats of the passers-by.

Insect life is varied enough to allow the close observer a wide choice of subject, and blind he must be who can not find in this great field many and interesting studies.

Down along the shore is a low wall of large stones built by a former owner for a breakwater. To a student with an interest in minerals and rocks, these stones are instructive objects; for there are boulders of gneiss rocks and granite, sandstone almost changed to quartz rock, quartz conglomerate, and dark grey limestone. All of these have stories to tell, and some of them are miles away from their original home, having been carried by the great glacier. All show traces of the action of water and ice; their rough edges are rounded, and their sides are scratched and sometimes flattened.

The public road occupies the summit of the old beach, where the river was both wider and deeper than now. Away across the river the old beach may be seen quite plainly at the same height.

Just as if these evidences were not sufficient to convince us of the fact, another is near at hand, for there are stratified deposits of clay, sand, and gravel exposed in the sides of a small gully which has been made by a little stream flowing across the road not five rods away.

In this home property bird-life, too, is abundant and readily studied. During July and August the warbling vireos whistled delightfully from the tops of the trees, the swallows darted swiftly after the numerous insects which filled the air above the shallow waters, the nuthatches and the black-and-white warblers searched the tree trunks for insect food, and the flycatchers made sallies from their perches on the lowest cottonwood limbs to catch insects on the wing. Besides these were several kinds of water fowl and shore birds down by the river, the woodpeckers, the kingfishers, the catbirds, the American goldfinches, the yellow warblers, the red-winged blackbirds down among the reeds, the phœbes, the chickadees, the domestic sparrows, the song sparrows, the chipping sparrows, and many others, all within a few rods of the observer.

Space forbids further notice of the many other interesting objects of study, and problems which the young student finds awaiting solution about his own home.

This paper is practically a plea for a closer study of our home surroundings, a study too often neglected by our nature students under the impression that nothing interesting or instructive can be found there. As a matter of fact, the home with its garden and lawn is the very best field for Nature study. We require to give more attention to the commonplace things and to understand their real significance in everyday life. And how many commonplace things there are to study when we actually *see* with our eyes and *hear* with our ears, and when we realize that every detail of the structure of a plant, animal or landscape has a history and a meaning, and how few of our commonplace studies are beyond the comprehension of the smallest child!

When we know the things close at hand, we shall understand the things at a distance. When we understand the life-relations of the inhabitants of our yards and gardens, we put ourselves

into a right relationship with the big Nature world about us.—Study our home surroundings.

Down in a low corner of the grounds the soil is covered with much decaying vegetable matter. Ferns and mosses grow there and the leaf-screen of the trees allows but little sunlight to reach the damp soil. Year after year the organic matter accumulates in this corner, for pieces of limbs and bark are added to the leaf-mould, and year after year the decay continues. It is worth our while sometimes to observe the disintegrating agents at work. The leaves and twigs are often eaten by borers, sow-bugs, and centipedes, and the fungi continue the work on the stems which they have made to fall. Rupturing the bark of the dead limbs black pustules of many kinds of "sac-fungi" may be seen. The fine threads of these fungi have already penetrated the wood of the limb in all directions, and have come to the surface to produce their spores. On many limbs are slimy masses of the "slime-fungi," which also sends fine threads through the wood in search of food.

We may observe, moreover, that the bark breaks down less rapidly than the wood, for bark, we know, is largely composed of corky matter, which absorbs water but slowly; and as the destructive agents require moisture, its break-down is quite slow. The lichens, mosses and algæ that live on the bark, no doubt, hasten the operation, but the main agents are certain larger fungi and the bark-beetles. Moulds and bacteria follow and break down the tissues much farther. Soon this vegetable matter becomes mixed with the soil, forming a new soil from which mushrooms and other similar forms get their food-material. The decay continues through the activity of other delicate underground fungi attached to the rootlets of trees, whose threads explore the ground in every direction. In a few years the vegetable tissue, therefore, is completely broken down and incorporated with the mineral matter to form humus soil.

THE OTTAWA FIELD-NATURALISTS' CLUB.

PROGRAMME OF WINTER SOIRÉES, 1905-6.

1905.

Dec. 12.—The President's Address and Report.

Address, by Dr. J. F. White, Principal of the Normal School.

Illustrated Lecture: *Apparent Consciousness in Plants and Animals*,
by the President, Dr. S. B. Sinclair.

1906.

Jan. 9.—Illustrated Lecture: *The Geology of Strathcona Park and other
Ottawa localities.* Dr. H. M. Ami.

Report of the Geological Branch. W. J. Wilson, Ph.B.

Jan. 23.—*The Migration of Birds.* C. W. G. Eifrig. Illustrated by specimens.

Report of the Ornithological Branch. Mr. A. G. Kingston.

Feb. 13.—Illustrated Lecture: *Trees, Shrubs and Plants for the Adornment
of Home.* Dr. W. Saunders, of the Central Experimental
Farm.

Feb. 27.—Conversational Evening: short addresses on various subjects.

Prof. J. Macoun: *Botany.*

Dr. J. Fletcher: *Collection of Insects for Schools.*

Dr. Otto Klotz: *Gravity.*

Dr. H. M. Ami: *Methods of Work of the Ottawa Field
Naturalists' Club.* Illustrated by lantern views.

Mar. 13.—*Fish Culture.* Prof. E. E. Prince, Commissioner of Fisheries for
Canada. Illustrated by specimens.

Mar. 27.—ANNUAL MEETING.

Address by Mr. A. Gibson: *Method of Studying Insects followed at
Central Experimental Farm.*

All the meetings will be held in the Normal School, at 8 o'clock p.m. sharp.

At the end of the several lectures and addresses remarks may be made
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meetings being to encourage discussion of the subjects dealt with. All are
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CONTENTS.

	PAGE
1. Descriptions of New Species of Testudo and Baena with remarks on some Cretaceous forms, by Lawrence M. Lambe, F.G.S., F.R.S.C.	187
2. A New Northern Antennaria, by Edward L. Greene..	197
3. The Swan Song of the Leaves, by Mary Elizabeth McOuat, B.A.	197
4. Notes on Some British Columbia Mammals, by William Spreadborough ..	200
5. Meetings of the Botanical Branch ..	201

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THE OTTAWA NATURALIST.

VOL. XIX.

OTTAWA, MARCH, 1906.

No. 12

THE EGGS OF THE FRESH-WATER LING.

By Professor E. E. PRINCE and ANDREW HALKETT, Marine and Fisheries
Department, Ottawa.

The discovery of the eggs of the burbot or fresh-water ling (*Lota maculosa*, LeSueur) deposited by the parent fish, exhibited in the tanks of the Ottawa Fisheries Museum, is a matter of unusual scientific interest.* While the burbot is not a valuable or esteemed species, it is, in many ways, an interesting fish to the naturalist. It is known in different parts of Canada by no less than fifteen different names,† most of them uncomplimentary; indeed, as the late Frank Buckland said, many years ago, of the British burbot or burbolt, "they are such a stupid and ugly fish that I cannot advise trouble to be taken with their dissemination they are so destructive to the eggs of all other fish they eat an enormous quantity of fry, and they swim after the manner of eels." The same author stated that they are a nocturnal fish, spawn in the deepest holes in lakes, 480 to 540 feet deep, and after having been frozen stiff will revive. Belonging, as the burbot does, to the family *Gadidae*, which includes the cod, haddock, hake, whiting, and other valuable food fishes, it might be imagined that it is excellent as a table fish. Of its edible qualities the most opposite opinions are held. On some lakes of the Northwest it is highly regarded; but in other localities, indeed generally, it is not regarded with favor, and has been even pronounced poisonous. In this connection, the following extract from a special report, published in the Blue Book of the Marine and Fisheries Department, 1900, has an interest and may be appropriately quoted here (*vide* report mentioned pp. lv-lvi).

* The eggs were collected by Mr. Andrew Halkett for study in a fresh living condition, while others were preserved by him in formalin.

"If great variations obtain regarding the naming or mis-naming of this fish, a corresponding diversity of opinion exists regarding its edible qualities. At a remote Hudson Bay post, in the Canadian Northwest, I found that the flesh was regarded as poisonous, indeed, cases of poisoning after Indians and employees of the post had eaten the fish were mentioned, and it was pointed out that even the dogs would not eat it. The dogs are usually fed on the excellent whitefish and decline being put off with inferior fare, and it is a fact pointed out by various explorers that the dogs of the Northwest, used in the dog-trains, refuse to eat the burbot. I found, however, at another Hudson Bay post, that the fish was often eaten and was regarded as most excellent, no ill effects having been noticed. Belonging as it does to the cod family, it should be an excellent fish for the table, like its near relatives the cod, haddock and hake. In one of the lakes of New York State (Lake Winnipiseogee) it is pronounced equal to the whitefish for table use, and the liver is generally considered a rare delicacy.

"Dr. Richardson (*Fauna Boreali-Americana*) is recorded to have said that 'the flesh of the fresh-water cusk is firm, white and of good flavor; the liver and roe are considered delicacies, when well bruised and mixed with a little flour, the roe can be baked into very good biscuits, used in the fur countries as tea bread.' Professor Brown Goode spoke of it as a very excellent fish, especially for boiling; though Dr. T. H. Bean pointed out that apart from the liver, the fish is not esteemed in the Great Lake region and northward, but in the rivers of Montana the burbot is in great favor."[†]

Pennell states that the flesh of the English burbot is white and firm, and is considered superior in flavor to that of the eel.

It has a very wide geographical distribution in the old world and on this continent. It has been recorded in Germany, Austria, Russia and other countries; but it is of very local occurrence in the British Islands, being wholly absent from some rivers and plentiful in none. The belief prevails that it is decreasing in numbers and doomed to extinction. It does not appear to be

[†] Report of Department of Marine and Fisheries (Fisheries) 1900, p. lv.

found in Scottish or Irish waters. From New England and the basin of the St. John River, New Brunswick, it extends through the Great Lakes and more northern waters to the Manitoba and Athabaska lakes and rivers, while specimens have been procured in the Okanagan and Columbia river regions in British Columbia. Drs. Jordan and Evermann speak of it as abundant in the north as far as Bering Straits and the Arctic Seas, but rare in the Ohio and Upper Mississippi. A number of specimens are preserved in the Ottawa Fisheries Museum, some being local, *e.g.*, Lake des Chene, Ragged Lake, Algonquin Park, Healy's Falls, and Rock Lake, Haliburton Co., Ont., and one specimen sent from Swan River, near Vernon, B.C. As a rule it is regarded as a pest, and fishermen are of opinion that it is a great destroyer of the spawn and young of valuable fishes; but its feeding habits require accurate investigation

As the cod and most of the *Gadidae*, so far as known, produce eggs, which, as Dr. A. S. Packard states, "rise to the surface of the water, on which they float," it has long interested naturalists to know of what character are the eggs of the burbot, the only fresh-water member of the family. If, as seems practically certain, the burbot is a species of the cod family which has changed its habits and become a non-marine form, it was highly interesting to ascertain whether its eggs retained the characteristics of its ocean-inhabiting relations or not. Fish authorities and embryologists have long been on the look out for the eggs of the burbot for that reason. The minute delicate glassy transparent globes, floating lightly, like invisible soap-bubbles near the sea's surface, are called pelagic or buoyant eggs; and the eggs of the cod, haddock, pollock, whiting, hake, marine ling, and other *Gadidae*, are typically pelagic. Could it be that a species of that family, permanently resorting to fresh water, would have retained that interesting type of egg, or has the character of the egg changed with the change of the habitat of the fish?

Thirty years ago a Belgian investigator, Dr. C. Van Bambeke, described the egg of the fresh-water ling, inhabiting rivers and lakes in Europe,* but he never secured them after being deposited

* Mém. Couronn. l'Acad. Roy. de Belgique, tome XL. 1876.

naturally. He took them from the parent fish before they were deposited, and while he obtained and described the egg and published a drawing of it, no one could say if the features described were normal or not, and it was not possible to say whether or not it possessed buoyancy, and belonged to the pelagic type of ovum. Van Bambeke's account described the egg of the burbot as an extremely small, spherical, translucent ovum, with a pale greenish oil globule, surrounded by a thin coat of protoplasm, the globule being held in a fixed situation, in the yolk matter, by a column, or thick strand, of tenacious protoplasmic material. How does this description compare with the features of the eggs, several hundreds of which were deposited, at the end of January, by the parent fish in the Ottawa Fisheries Museum and examined under moderate powers of the microscope? A study of these eggs yielded this remarkable result, that they have all the features of the typical pelagic eggs which occur abundantly in the ocean where cod, sea-ling and other Gadoids spawn. The burbot's egg is somewhat buoyant, of minute size, extremely transparent, and delicate in structure. As Van Bambeke stated, there is a single large oil-globule, greenish in hue, though almost colorless in transmitted light, but not fixed or held in place by a strand of protoplasm. Now, the burbot is a close relative of the sea-ling (*Molva vulgaris*) and of the sea-cusk (*Brosmius brosme*, Muller), and bears a strong external resemblance to them, having an elongated eel-like body, a flattened head, a small first dorsal fin, and a very long second dorsal and anal fin, as well as a rounded spatulate tail. The sea-ling and sea-cusk produce small pelagic eggs, each of which contains a single large bright oil-globule, that in the ling's egg pale greenish; that in the sea-cusk's egg being terracotta in tint. The egg of the fresh-water ling almost exactly resembles the ovum of its marine relative in all essential features. The ova of the marine ling (*Molva vulgaris*), to quote from the large Scottish monograph (the most elaborate account of fishes' eggs ever published),* "are less buoyant than some other Gadoids, e.g., *Gadus morrhua* and *G. aeglefinus*, and sometimes, though living, sink to the bottom in quiescent water, yet success-

* Professors McIntosh and Prince, Trans. Roy. Soc., of Edinburgh, Vol. xxxv, Pt. iii, No. 19, p. 668.

fully develop. The ova of the ling are, indeed, more delicate and more susceptible to unfavorable conditions than those of the cod and haddock." Now, these observations would apply exactly to the present egg. It is so light that the slightest movement in the water carries it hither and thither. In still water it falls to the bottom, and, indeed, unlike marine eggs, which are in water of greater specific gravity, the egg of the fresh-water ling cannot permanently float. It is perfectly spherical and has a diameter of 1.77 mm. (= .0695 inch) and the globular oil sphere measures .354 mm. (= .039 inch) in diameter. The egg of the marine ling measures 1.68 mm. (= .066 inch, or even .0916 inch) in diameter and the oil globule .96 mm. (= .037 inch), so that the fresh-water species produces an egg in general of smaller size, indeed in proportion, it may be said to the different size reached by the full grown form in both species. Whereas the burbot reaches a length of only 12 to 30 inches and a weight (according to Pennell) of 2 to 8 pounds; the marine ling may measure 24 to 72 inches in length and a weight ranging from 15 to 60 pounds.

None of the burbot's eggs were fertilised, so that no germinal disk was formed, though a thin layer of protoplasm surrounded the ball of clear yolk fluid. The yolk was not granular, and the bright globule of oil lay free in the yolk and moved readily about as the egg revolved when pushed by a scalpel on the stage of the microscope. In some of the eggs a thin irregular envelope of protoplasm collected round the globule, but in most examples it was not present. A perivitelline space separates the yolk-globule from the thin capsule of the egg. The capsule itself is a simple transparent shell, as in all pelagic types of ova; and in optical section it appeared as if double, and concentrically striated—a false effect—but repeated and careful examination showed radial striations in the thin capsule; these striations apparently corresponding with minute dots or pits occurring all over the exterior. The micropyle showed the usual features, a slight conical thickening in the centre of which was the aperture seated in a crater-like depression. As in the case of the marine ling, the eggs of this fresh-water form are delicate in the extreme, and very readily

burst when manipulated under microscopic examination.* The tension, due to capillary attraction when a cover-glass was placed upon the glass-side, caused them to burst, and the bright oil-globule lightly bounded out of the egg, while the thick yolk slowly poured out like clear mucilage. Unfortunately, no ripe male fish was available or the early embryonic stages of the fertilised ovum, and larval form of this species, could have been studied for the first time. In view of the character of the eggs, as now discovered, the larva is without doubt a very minute and delicate creature, far more minute and delicate than possibly any other young fresh-water fish. The post-larval stages of the marine ling, we know, are very wonderful and extraordinary owing to the enormous wing-like ventral fins, "their most striking feature being the extraordinary length of the ventral fins of an ochre yellow color, with specks of black pigment scattered over the inter-radial membrane."*

No doubt Buckland when he defined the spawning period of the European burbot as from the end of January to the beginning of March based his conclusion upon an examination of the ovaries in dissected specimens, and his conclusion was accurate, as the mature eggs now described were deposited about the twentieth of the month of January. The statement that the spawning sites selected are in the deepest holes in lakes, etc.,† cannot be correct, as a delicate and practically pelagic egg, such as that now demonstrated to be the burbot's egg, must be deposited in clear shallow water, and judging by analogy, the development will be rapid, and the young hatch out in a few days, possibly ten to twenty days. Actual observations alone can decide the validity of these surmises, but the newly-deposited egg, as now described, differs from that of any other fresh-water fish hitherto recorded.

* Professor McIntosh noted this feature in *Molva vulgaris* and said, "The zona is not so soft and tough as in the cod and haddock; but shows greater resistance, bursting rather than collapsing under pressure." Trans. Roy. Soc. Edin. Vol. xxxv, p. 827.

** McIntosh and Prince : *op. cit.* p. 830.

† Buckland, Nat. Hist. Brit. Fishes, 1881, p. 35.

EUPITHECIA YOUNGATA.

A GEOMETRID MOTH FROM OTTAWA NEW TO SCIENCE.

By GEO. W. TAYLOR, Wellington, B.C.

During the past three years I have devoted nearly all my leisure to the study of North American Geometridæ, and I have been very greatly helped by a number of entomologists who have allowed me to examine the specimens in their cabinets and who have, moreover, liberally added to my own collection. In this way I have made the acquaintance of a large majority of the American species so far made known to science. There are, however, many forms that are still undescribed, and, though these "new species" are naturally more numerous in the West and South than in the Eastern Provinces of Canada or the older States in the Union, where entomological researches have been carried on for a century or more, there are still some—perhaps more than we suppose—of these nondescripts to be found even in Ontario.

Indeed, the subject of the present paper was captured close to Ottawa itself, which, when we consider the many eminent entomologists who have worked there so enthusiastically during the last twenty-five years and the activity of the members of the Field-Naturalists' Club generally, might be looked upon as the least likely place in all Canada to produce novelties. The captor of the species I am about to describe, was Mr. C. H. Young. Mr. Young has sent me for study, from time to time, specimens of nearly all the Geometridæ he has taken at Ottawa, Meach Lake and the Mer Bleue; and, after seeing these specimens, many of which he has generously allowed me to retain in my own cabinet, I am compelled to say, as so many others have said, that more beautifully prepared specimens could not be imagined.

Mr. Young sent me not long ago a number of small Geometridæ from Ottawa for determination. Among these I found no fewer than eight species of the interesting genus *Eupithecia*. Of these little moths, "Pugs," as we used to call them in England, there must be over one hundred species native to North America; but only about one-half that number have been

described, and most of these have been made known in quite recent years.

When Walker catalogued the Eupitheciæ of the world in 1862, he only credited North America with five species. In Packard's Monograph published in 1876, only twelve species were recognized. But the labors of Dr. Hulst have vastly increased our lists in this genus and the allied genera, so that in Dyar's Catalogue we find enumerated no fewer than 55 species of *Eupithecia*, four of *Gymnocelis* and eight of *Eucymatoge*—67 pugs in all; and, yet, even this number falls considerably short of the number of apparently distinct species which are represented at the present moment in my own collection.

The species sent by Mr. Young all belong to the typical genus *Eupithecia*, and I have determined them as follows :

1. *Eupithecia geminata*, Pack., (which is probably, but not certainly, the *Eupithecia coagulata* of Guenee and is certainly not the *E. absinthiata*, Linnæus, under which name it appears in all our recent lists,
2. *Eupithecia ornata*, Hulst,
3. „ *latipennis*, Hulst,
4. „ *palpata*, Packard,
5. „ *albicapitata*, Pack. (a very rare species, so far as I know, this being the first specimen to come under my notice),

and three species which are apparently without names. Two of these require further study of more abundant material before they can be safely characterized ; but the third I propose to describe now and to name after my kind correspondent from whom I have received the very beautiful and absolutely perfect specimen which I shall designate the type of the species.

I may add here that I shall be greatly obliged, and I am sure science will be benefited, if Canadian entomologists will endeavor to collect good series of *Eupitheciæ* during the coming season, in order that the species native to the Dominion may be correctly determined, and those that prove new, furnished with suitable names.

Eupithecia youngata, n. sp.—Expanse, 25 mm. Palpi not very long, bushy, blackish. Front dusky, cinereous. Thorax

brown with a dark transverse band anteriorly. Abdomen as thorax, 2nd segment a little darker, posterior edge of each segment whitish. Forewings obtuse at apex, outer margin well rounded, same color as thorax, the costa rather darker and the cross lines distinctly lighter than the ground color; basal line double, very irregular, being angled sharply outwardly at cell and below vein 2; median line also double, not well marked, making a sharp outward angle to include the conspicuous black discal dot, then running in an almost straight line to middle of inner margin; extra discal line also double, dislocated at vein 6, then in a regular curve parallel to outer margin; both median and extra discal lines show in more or less well-defined whitish spots on veins 2 to 6 inclusive; and there are short black dashes on each of these veins between the median and extra discal lines; submarginal line white, conspicuous, regularly scalloped at each vein and forming a distinct V at anal angle; a fine black marginal line; fringe dotted with dark brown between veins. Hind wings well rounded, lighter brown than fore wings with six darker lines: the first two are basal and do not extend further from inner margin than to vein 2; the next two lines are extra discal and almost complete; the two outer lines extend completely across the wing; a very small and faint discal dot; marginal line and fringe as on fore wings. Beneath paler; fore wings with a linear discal dot and the extra discal markings of the upper surface reproduced; basal portion of wing without markings except a dark spot on the costa, indicating the position of basal line. Hind wing as above, but with all the lines more regular and reaching to the costa; the discal spot is distinct, black; the 1st extra discal line is diffuse and very evident; the 3 outer lines appear as spots between the veins, the outermost line being least conspicuous. The under side of thorax and of the basal segments of the abdomen is very pale, almost white, but the posterior portion of the abdomen is nearly black.

Type, one specimen. Meach Lake, Ottawa, 7 June, 1905, C. H. Young. Co-types, two specimens. Catskill Mountains, 2 and 10 July, 1901, (No. 1) R. F. Pearsall.

THE CULTIVATION OF OUR NATIVE ORCHIDS.

By J. H. C. DEMPSEY, Hamilton, Ont.

About four years ago I was shown a specimen of *Cypripedium pubescens* by Dr. Douglas Storms, of Hamilton. Often as I had been rambling around the mountain and ravines in our neighborhood, I had never found it; but I made up my mind to discover its retreat, no matter how secluded. So one Sunday a couple of friends joined me in an expedition up the ravine leading from the "Valley Farm," where Mr. Hendrie keeps his racing stable near the Valley Inn on the Waterdown road. We came on it in all its glory, a truly fairy flower, with its canary-colored sabot, and its red-veined corkscrew sepals standing straight out. It looked so odd, so out of place, that being unacquainted with it before we declared it more beautiful than any rose. It proved quite plentiful in this particular spot, the shade was not too dense, and the sun flickered through the foliage, the land had been undisturbed, saving that the big forest trees had been thinned out; and just enough space and light and sunshine for their proper growth and to paint the blossoms in their brightest hues, and not have them looking sickly from being in too much shade.

Through the ravine ran a stream, and about thirty feet up the hillside on a substratum of red clay with a top soil of leaf-mould it grew. Occasionally we found a stem with two blooms on it. On the hill-top, in an oak wood, we found the "bird-on-the-wing," a lovely lavender-pink orchid-colored flower much like an orchid. We brought away about thirty plants of *Cypripedium pubescens*, and next year they all bloomed and some have borne seed. I planted them in a fern bed in a shady spot where they got the sun part of the day for a few hours, as I have found them under similar conditions.

Since finding *Cypripedium pubescens* I have found *Cypripedium parviflorum* at Lake Medad and planted it on similar ground, and it was in blossom last year about the end of April, and grows successfully and multiplies.

Last year I went for a drive with some friends to a concession back of Lake Medad about three miles, and found the *Cypri-*

pedium spectabile, and when we saw it at first I thought of those lines from Gray's Elegy :

" Full many a flower is born to blush unseen,
And waste its sweetness on the desert air."

We found it, as large as an Iris, hidden amongst the cedars in the damp mold, sometimes pure white in the shade, and where it drank in the sunshine, suffused with a rosy purple blush or striped on the sabot as if it had been done by some peri. We brought home a couple of dozen plants, some in blossom, sometimes two on a stem, and others in bud. This was the middle of June, but they stood the removal all right after a night's refreshment in a pail of water, and they got well heated in the ground and the unopened buds came out. They were found in a ravine about 100 feet in depth on either side and about 300 yards wide, with a cedar swamp in the bottom, and a tropical atmosphere, an ideal place for orchids. We also found several varieties of *Habenaria* coming into bloom in the swamp, and on the hill-top in a rich wood the Showy Orchis in great abundance, just out of bloom a week or so, with three or four stems of bloom on a clump which had borne from five to six flowers; it was in seed pod at the time.

In treating them after removal I imitated natural conditions as much as possible, dug a trench one and a half feet deep and put a bottom layer of broken flower pots and stones, on top of that a layer of moss from the limestone rocks at the mountain, and again on top of that a layer of sphagnum moss, about eight inches of moss in all, and on top of that a couple of inches of leaf mould, set my plants on it, and again three or four inches of leaf mould and swamp muck.

In April last I sent to Mr. Edward Gillett, of Southwich, Mass., U.S., for some bulbs of the native orchids advertised in his catalogue. Among the varieties I sent for were : *Calypso borealis*, which grew but did not bloom, but I hope to see it next year; *Calopogon pulchellus*, a dainty little purple-pink flower, very beautiful, with from four to five blossoms, which blossomed in the same bed with *Cypripedium spectabile* ; *Cypripedium acaule*, which I planted in higher ground, and out of a dozen plants I got four blooms, very lovely and most delicately veined with pink of a reddish hue. I am very doubtful if I will see it again next year,

as Mr. Alexander, of the Customs Department, brings it down every year from his island in Georgian Bay. I saw a lovely bunch of it in his garden in bloom, but he said it [slipped away and he did not expect to see it again next year; *Cypripedium montanum*, which blossomed all right and bore four or five small white blossoms on a stem, the sabot pure white with purple dots inside and red wings, not curled as in *pubescens*. It is not a native here but of the west beyond the Rockies; *Cypripedium spectabile*, which was gorgeous in the extreme. I had three clumps with ten or eleven blossoms on at once. Two clumps had each two stems with twin blooms on a stem. I had them photographed, they looked so rare and lovely, as if they came from the "Garden of Allah"; *Habenaria blephariglottis*, which grew but did not bloom; *Habenaria ciliaris*, which grew but did not blossom. I hope to see them next year; *Liparis liliifolia*, which blossomed with a raceme of six or seven purple-brown flowers, a true orchid but inconspicuous; *Pogonia ophioglossoides*, a lovely pink and white flower which blossomed successfully; *Spiranthes cernua* (ladies' tresses) grew but did not blossom.

As to the growing of our native orchids, nature must be imitated as much as possible both in location of planting and nature of soil. Those found in sphagnum moss in bogs and swamps should be planted in about a foot of sphagnum moss with a top dressing of four or five inches of swamp muck and leaf mould, and the ground and place prepared with as much care, and no manure of any kind used with them other than pine needles or cedar leaves, and a sprinkling of powdered charcoal which can be given them every three years, as it sets the color and makes it of a richer hue. These take the place of more violent manures.

Cypripedium acaule and *Calypso borealis* are the hardiest to grow. I think in a bed made of chopped granite mixed with coal ashes, with plants set in rotten leaf mould and pine needles well rotted, the turpentine would kill insect pests and cut-worms, and the undersoil would be too poor for cut-worms and other enemies to exist in. I inferred this from the fact that in Manitoba and Parry Sound, where it is so hard to get worms for bait for fishing, the ground seems denuded of them, and the earth seems free from the pests that attack most plants.

The orchids found in the vicinity of Hamilton are *Cypripedium pubescens*, in quantities when you find its hiding-place ; *Cypripedium parviflorum*, at Lake Medad and its neighborhood, sometimes pale yellow, sometimes rich canary, according to location and the richness of the soil, but it is not plentiful ; *Cypripedium acaule*, said to be found near Grimsby, but I have never met it yet in nature ; *Cypripedium spectabile*, in a ravine back of Lake Medad and very plentiful there ; several varieties of *Habenaria*. I found *Goodyera*, or rattle-snake orchid, at the Marsh, or "Cattle's Paradise" in a ravine where the broad beech fern was plentiful. This is the only place I know where you can find it here. *Orchis spectabilis* I had in bloom in my garden last year, a pretty waxy white and lavender, found in a ravine near Desjardin's canal (but not very healthy or luxuriant plants), about ten feet above a little brook. I have found it since back of Lake Medad, and hope to have it fine next year.

In closing, I would say that those found in boggy places, like *Cypripedium spectabile*, *Calopogon pulchellus*, *Habenaria blephariglottis*, *Habenaria ciliaris*, *Liparis liliifolia*, *Pogonia ophioglossoides* place in a false bog as I have described and they will grow with success, and water them twice a day while the sun is not on them with a good soaking each time.

For *Cypripedium pubescens*, *Cypripedium parviflorum*, *Orchis spectabilis*, *Goodyera*, and *Spiranthes*, put a subsoil of red or blue clay to retain the moisture and a top dressing of leaf mould three or four inches and you will have them year after year as I have had them for the last three years ; and water them well once a night with a plentiful supply of good cold water.

Ferns and orchids are more of a fad with me. I have taken up the collecting of them in my spare moments in a particular line of botany, and it has proven very interesting. I have about thirty-two or thirty-three varieties of our native ferns, and had five varieties of *Cypripedium* in blossom at once last June.

I can assure my readers that it has given pleasure and also brought me into a closer acquaintance with the aristocrats of the floral kingdom—the orchid, so shy, so exclusive and so secluded.

Jan. 6th, 1906.

BOREMYS, A NEW CHELONIAN GENUS FROM THE
CRETACEOUS OF ALBERTA.*

By LAWRENCE M. LAMBE, F.G.S., F.R.S.C., Vertebrate Palæontologist to
the Geological Survey of Canada.

The writer described in the January number of this journal a new species of Pleurosternid turtle from the Cretaceous rocks (Belly River or Judith River formation) of Red Deer river, Alberta. The material on which the species was based, was obtained by the writer on Red Deer river in 1898 and 1901, and consists of the entire plastron with the anterior half of the carapace of one individual (type), a second carapace, and parts of other plastra, all of the specimens being from the same locality and horizon near the mouth of Berry creek, a tributary of Red Deer river. The species in question was named *pulchra* and was referred to Leidy's genus *Baëna*. It is now considered that this species belongs to a new genus, distinct from *Baëna*, for which the name *Boremys*, indicative of a northerly habitat, is proposed.

The carapace of *Boremys pulchra* is remarkable in having a row of three large supramarginal shields on each side, in line with the 2nd, 3rd and 4th vertebral shields, between the costals and the marginals. The total number of costal shields is twelve, there being the normal number, eight, with one on each side of the 1st vertebral and one on each side of the 5th vertebral.

The presence of supramarginals is regarded as a generic character of some importance which, taken in conjunction with the structure of the plastron, indicates a hitherto undescribed type of Pleurosternid quite distinct from *Baëna*, its probable nearest ally.

As regards the anterior and posterior costal shields of *Boremys pulchra*, the anterior ones at least occur in *Baëna arenosa*, *B. undata* and *B. hebraica*, as described and figured by Cope in his "Tertiary Vertebrata," vol. iii, 1884.

The genus *Boremys* may be characterized as follows :—

Supramarginal shields present in the carapace ; mesoplastra well developed, in contact in the median line for some distance ;

* Communicated by permission of the Acting Director of the Geological Survey of Canada.

intergular shield divided; inframarginal shields present on the bridges.

The specific characters of *Boremys pulchra*, the type of the genus, are :—

Costal shields short and pointed distally; supramarginals well developed, longer than broad; first neural plate divided; entoplastral plate narrow, diamond shaped; plastron longer than broad; anterior plastral lobe smaller and more pointed than the posterior lobe; bridge long and rather narrow.

In *Baëna arenosa*, Leidy, 1870, from the Bridger Eocene of Wyoming, the type of the genus, there are no supramarginals, nor are there any in *B. undata*, Leidy, 1871, also from the Bridger Eocene of Wyoming. In the latter species the mesoplastral plates (not shewn in Leidy's figure of the plastron of the type specimen) converge to a point inwardly and meet in the median line.

The following Eocene, Laramie and Cretaceous species have been assigned to the genus *Baëna* :—

B. hebraica, Cope, 1872. Bridger Eocene of Wyoming; no supramarginals.

B. ponderosa, Cope, 1873. Bridger Eocene of Wyoming; known only from small fragments of carapace.

B. hatcheri, Hay, 1901. Laramie of Wyoming; no mention of supramarginals in the carapace.

B. marshi, Hay, 1904. Laramie of Wyoming; no mention of supramarginals in description.

B. cephalica, Hay, 1904. Laramie of Wyoming; known from the skull only.

B. antiqua, Lambe, 1902. Belly River (Judith River) formation of Alberta; type specimen does not include the distal ends of the costal shields.

Relying on the presence of supramarginals as the chief character of the carapace of *Boremys* by which this genus is to be distinguished from *Baëna* it is clear that information regarding the structure of the carapace in some of the species of the above list is needful before their true generic affinities can be fully determined. Judging from the shape of the mesoplastral element (in combination with a divided gular shield and the development of

inframarginals on the bridge) in *Baëna hatcheri* and *Baëna marshi* it is possible that these two species may be found to be referable to *Boremys* rather than to *Baëna*.

Supramarginal shields are described as occurring in *Proganochelys quenstedti*, Baur, from the Upper Trias (Keuper) of Württemberg. They are stated to be present in *Platychelys oberndorferi*, Wagner, of the Upper Jurassic of Bavaria, although in the figures of the carapace it is not made clear to what extent they are developed. Also they are found in the living *Macrochelys temminckii* (Alligator Turtle) of the Mississippi and Missouri valleys.

The presence of supramarginal shields in the carapace of this Cretaceous species is regarded as an archaic character handed down from earlier forms. The presence of six costal shields on each side also appears to be a stage in the gradual reduction of the total number of shields of the carapace.

BOTANICAL BRANCH.

On the evening of January 4th, the following members of the Botanical Club met at the residence of Mr. A. E. Attwood: Prof. Macoun, Dr. Ami, Dr. Blackadar, Messrs. W. T. Macoun, R. B. Whyte, T. E. Clarke, W. C. Ewing, and D. A. Campbell.

The greater part of the evening was devoted to discussing the merits of a plan or key for the easy identification of the ferns of Ontario. It was decided to test the efficacy of the so-called popular key next summer.

Some time was devoted to microscopic work, after which Dr. Ami showed a large number of specimens of fossil fruits collected some years ago in the State of Vermont. Dr. Ami has written an interesting account of these fossil fruits, and his paper will appear in a future number of THE OTTAWA NATURALIST.

A. E. A.

NATURE STUDY.—No. XXXII.

THE SCHOOL GARDEN AND THE COUNTRY SCHOOL.

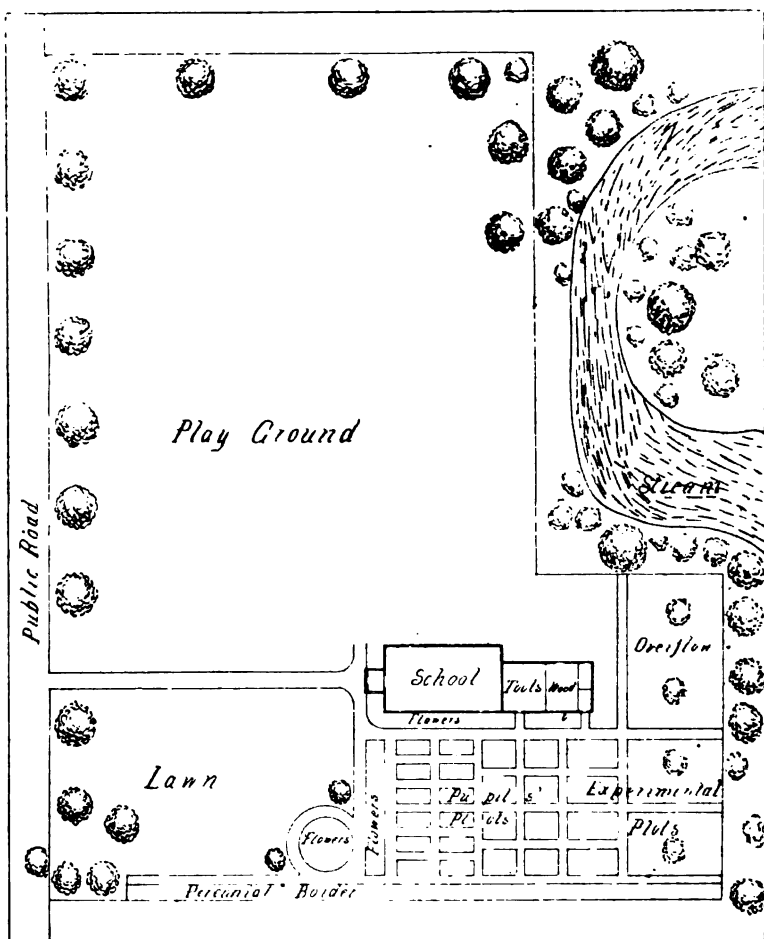
By GEO. D. FULLER, Director of School Gardens, Macdonald Rural Schools, Knowlton, Que.

The place the school garden is to occupy in connection with the country schools of Canada is yet an unsolved problem. We are told of its advantages and are beginning to realize something of its possibilities as a field for nature study, as the laboratory for the student of natural science, and as a training school for the progressive farmers of a coming generation. Certainly its advantages are great, but there are many difficulties to be surmounted before the school garden can become recognized as a necessary part of the equipment of every rural school.

The solution of this problem has been begun in a systematic way in the Macdonald Rural schools, which have been endowed by Sir William C. Macdonald, and are being directed by Prof. Jas. W. Robertson, and perhaps there is no better way to indicate the progress made, to tell of the difficulties encountered, and to enlist the co-operation of others, than to describe one such school garden and tell what it has done for one country school. Such an account may point the way to teachers who wish to test the benefits of a school garden and may help them to surmount the difficulties and avoid some of the failures others have encountered.

In the spring of 1903, at Brome, Quebec, a little red school house, dull and dingy, seated with hard plank benches, was occupied by a teacher and some 25 pupils. Although in the country surrounded by large farms and farm houses with attractive grounds, the school yard was only four rods square, so that the wood shed crowded the school house almost into the road. For play ground there was the smooth, well travelled road. The poorest houses in the vicinity were less bare and uninviting. Fortunately the soil was fertile, well cultivated and with good natural drainage, so that the problem was not complicated by the question of moving to a locality where soil suitable for a garden could be obtained.

An acre of land immediately adjacent to the original school yard was bought and fenced by the Macdonald Rural School Fund, and plans for a suitable play ground and a school garden



Macdonald Rural School, Brome, Que.

were begun. This aroused the people of the school district to action, and they determined that, as suitable grounds had been provided, they would not have the front door of the school house

open into the street; so the school house was moved 100 feet back from the road and the wood shed placed behind it; both were painted and modern desks were placed in the school room.

These changed conditions made changes in the garden plan necessary, and an effort was made so to lay out the grounds that they might with advantage be copied by other rural schools in making the school environment a potent factor in promoting the refinement, courtesy and happiness of the pupils.

The trees fringing the banks of a stream made a good back ground for the whole. As one enters the gate a straight path leads directly to the door. On the left is the main play ground clear of trees except in the corners and along the sides, while on the right is a smooth lawn with trees which in a few years will make it cool and shady. Beginning towards the road, a border runs along the fence to the back of the garden, now well filled with perennials brought by the pupils and donated by friends. Beds of annual flowers front the garden and border the school house. Immediately back of the flower border come the vegetable plots, one for each pupil, while still farther in the rear are a few experimental plots, a few young fruit trees and extra space for coarse growing vegetables.

This arrangement provides a good open play ground, a pleasant bit of lawn and a garden convenient in size and design, the whole surrounding the school building so as to make an attractive picture. At a very small expenditure the school and its surroundings have been made cheerful and beautiful, in striking contrast to their former desolate condition.

The flower plots are under the charge of the older girls, but all the pupils join in caring for them. During the past season, from May till October, there was not a week but saw some bloom to delight the young gardeners, and often large bunches of flowers were picked every day. Pansies were the first to come and the last to go. The crocus and tulip too were favorites on account of their early flowering. Sweet alyssum, sweet peas, Phlox Drummondii, balsams, asters, verbenas, nasturtiums, poppies and sunflowers have proved the most satisfactory of the annuals. A

few of the plants were started in window boxes in the school, but most of the seed was sown in the open ground.

The coming of autumn frosts did not end the enjoyment of the flowers : as the heating did not permit window gardens at the school, the school flower 'garden was transferred to the pupils' homes. In October some of the more easily growing winter-blooming bulbs, such as paper white narcissus, Roman and Dutch hyacinths, and freesias, were potted at the school garden. These the pupils took home, and, treating them according to directions, they were soon able to report a fine lot of flowers. The pupil gardener was often so proud of his home-grown flowers that he would wrap up the pot and bring it to school to exhibit his success.

A most convenient size for the individual vegetable plots was found to be 4 x 10 feet for the younger pupils, and 8 x 10 feet for the older ones. Each pupil eight years old or over, was given a plot and allowed much freedom in choosing what should be grown in it; but radishes, lettuce, carrots, beans, cabbages, cauliflowers, beets and turnips have been most satisfactory. At the back of the garden, in an extra space, larger and more ambitious pupils grow corn, potatoes, squashes and cucumbers. All the produce of the individual plots is the property of their pupil owners and is removed and disposed of as each particular boy or girl decides, a wise restriction being that it shall only be removed when the instructor is present.

"But how," you may say, "is the school garden work done?"

While it is still winter, plans are made for the spring planting. These plans may be drawn to scale by the older pupils and will provide a good drawing lesson. Then, as warm days indicate the approach of spring, boxes of soil are placed in the windows and seeds are sown so that the plants may be well grown when spring has really come. This is also the best time to study the germination of seed and the growth of young seedlings; for, when the time for planting out of doors arrives, with it will come a profusion

of material and work to crowd the nature study hour to its utmost.

The garden is treated like the ordinary kitchen garden in the spring. It is fertilized with stable manure, ploughed, harrowed, and the services of a laborer are secured to assist in laying out the paths and removing a few inches of soil from them. Then the pupils assume ownership of their miniature gardens, level and rake their plots and sow them with the seed they have planned. Classes working together prepare the flower beds and sow the seed. During the planting season an hour or two each day are spent in the garden; or, if rain prevents work for a couple of days, the greater part of the afternoon is devoted to the garden as soon as the soil is dry enough to work.

Garden work is the most popular thing at school, and there is never any trouble in getting the garden planted and well cared for during the school session. The size of the plots is a troublesome question. Larger plots are more difficult to have kept clear of weeds during the summer months, but they promote interest on account of the larger material returns. The larger boys in particular wish to see a crop worth growing. Plots 10 x 16 feet have been well cared for by boys and girls 13 or 14 years of age.

After the planting season a half hour twice or three times a week keeps the garden clean and free from weeds. This time may be taken so as to interrupt the regular work very little. A little longer intermission in the afternoon, or closing the school room classes a half hour earlier, will provide plenty of time, and the book studies will not suffer; indeed, where school gardens have been started, the teachers have nearly always reported more interested pupils and a greater regularity of attendance, while parents at first opposed to the garden idea admit that it has not made progress in other subjects less rapid.

As the seeds have sprouted and the young plants have increased in size, the pupils have learned the conditions necessary for plant life, and, as they have seen buds unfold and leaves expand, the garden has provided material to be used in the class room as the subject of drawing lessons or English composition work.

The school garden has taken advantage of the love of activity so prominent in child nature, and by providing a field for the exercise of these activities has afforded an excellent opportunity for training the hand and the eye, and thus reaching the mind.

The care of the garden during the summer holiday has proved the most troublesome of all the school garden problems, and its solution is yet incomplete. Last summer very satisfactory results were attained by having the instructor and pupils meet once each week at the garden and spend two or three hours in caring for the plots. This vacation attendance was entirely voluntary; yet, so thoroughly were they interested in their work that there was a weekly attendance of 33 to 60 per cent. of the pupils enrolled. This was regarded as very satisfactory and sufficed to keep nearly everything in good order. One or two of the larger boys were usually hired to do any further work required to keep the weeds in check. Should the teacher be absent during the holidays, a hired caretaker for the summer will be necessary.

While it will not be desirable to abolish the summer vacation, where school gardens are established it may with advantage be shortened. The school should not close before the end of June, nor open later than the middle of August.

The commercial side of garden work has received no emphasis, although at one school a globe was purchased with money coming from the sale of vegetables, while many of the pupils have augmented their supply of pocket money by the sale of the produce of their plots.

The possibilities of the school garden as a field for nature study and as a treasury from which material may be drawn for class work in natural science, are as yet only touched upon. The drawing books contain representations of things from the garden, while diaries and reports of observations made, and experiments attempted, have given pupils practice in expressing their ideas in good English.

The experimental plots have done good work educationally. Plots of better varieties of vegetables and grain have attracted

attention of both pupils and parents by the larger yields thus obtained. The crop resulting from good seed has been compared with the produce of poor seed of the same variety, but the most satisfactory experiments have been those made with potatoes, both in comparing the different varieties and in showing the advantages of using the Bordeaux mixture to keep the plants free from disease.

The effects of spraying with the Bordeaux mixture were eagerly watched by the surrounding farmers, and the results were considered remarkable. In 1904 the sprayed plots in two gardens yielded 30 per cent more than the others, while in one garden the sprayed potatoes produced more than twice the quantity of marketable tubers dug from plots which had received no Bordeaux mixture. In 1905 spraying added over 10 per cent. to the crop in three gardens, 25 per cent. increase in one garden and 50 per cent. in another being the best results obtained.

Seeing potatoes grown under scientific treatment, which when dug yield over 100 bushels per acre more than those grown as their father's manage the crop, makes a more lasting impression on embryo farmers than any number of lectures or reports. This work in the school garden will bridge the chasm which has in the past existed between the experimentalist and the practical farmer, and, if these experiments with potatoes lead a fourth of the farmers in the district to adopt similar methods in their own fields, the community will be yearly enriched by cash returns many times greater than the cost of maintaining the school garden.

The aim of this part of the school garden work is not to teach technical agriculture but to lead to such an appreciation of scientific methods that pupils will come to regard the work of the scientist with favor, and be ready to accept his improved methods to aid them in more successfully meeting the conditions of modern life, whether that life be spent in the office, the workshop or on the farm.

The teachers in the schools where the gardens have been maintained for two years, have all declared that the results have surpassed their expectations, and they favor a continuation of the

work. It is true that it has added to the teacher's cares and responsibilities; but this has been more than repaid by the added interest and enjoyment it has brought into the school life.

As the pupils have planned their plots, have measured and staked them out, planted the seed and cared for the plants, they have become more skilful of hand and more accurate of eye, while working from a definite plan has trained the judgment and taught them to foresee the future. All these results would warrant the existence of school gardens, but more noticeable has been the response to the appeal made to the higher nature of the child.

As the school environment has been improved, there has been a marked change in the moral tone of the school. The pupils' attention has been turned to a consideration of the beautiful to the exclusion of many baser thoughts, and the resulting moral culture has found expression in more orderly behavior. A smooth bit of lawn and a lawn mower have proved themselves aids to good discipline, for the play hours are more rationally enjoyed on well kept grounds than on the old rubbish-littered premises, where the chief joy was often found in working greater destruction. In some schools there has been a very noticeable change in the attitude of the pupils towards the school room and grounds, and they now take pride in beautiful surroundings and care for them where formerly they sought but to make desolation more hideous. Some of the pupils have been led to attempt flower and vegetable plots at their own homes, and it seems hard to over-estimate the better training for good citizenship which pupils receive in such schools where school gardens have broadened the educational horizon and improved the school environment so greatly.

INDEX

TO THE

OTTAWA NATURALIST, VOL. XXIV, 1905 6.

	PAGE		PAGE
Agaric, The Fly	203	Caterpillars, Woolly-bear	159
<i>Amanita muscaria</i>	203	Chalmers, R., The Glaciation of	
<i>Anotitis debilis</i> , Greene	165	Mount Orford	52
<i>latifolia</i> , Greene	164	Charlton, H. W., On the Food	
<i>Menziesii</i> , (Hook.) Greene ..	164	Value of certain Mushrooms.	44
<i>picta</i> , Greene	165	Chelonian Genus, A new, from	
<i>tenerrima</i> Greene	165	Alberta	232
<i>tereticaulis</i> , Greene	165	Clarke, C. K., Note on Red-	
Antennaria, A New, from East-		billed Gulls.....	88
ern Quebec.....	156	<i>Cnicus muticus</i> , A new variety of	166
A New Northern	197	<i>Cnicus muticus</i> , var. <i>monticola</i> ,	
<i>Antennaria athabascensis</i> , Greene	187	Fernald	166
<i>neodioica</i> , Greene, var. <i>Gas-</i>		Collections, On the Formation of	
<i>pensis</i> , Fernald	156	Local	147
Apparatus required for Nature		Correspondence.....	72, 73
Study	75	Council, Report of	7
Atkinson, C. J., Mother Nature		Country School, The School Gar-	
and her boys	215	den and the	235
Attwood, A. E., Field Work at		Cox, P., Nature's Method of Re-	
the Ottawa Normal School		seeding White and Red Pine	67
Summer Course for Teachers	111	Criddle, N., The Fly Agaric....	203
Baëna, Description of new spe-		Dempsey, J. H. C., The Cultiva-	
cies of	188	tion of our Native Orchids .	225
<i>Baëna pulchra</i> , Lambe	189	Dresser, J. A., Letter <i>re</i> Glacia-	
Birds, A Short Introduction to		tiation of Mount Orford	73
some of our common	95	Eifrig, G., Nesting of the Night-	
New to Ontario	205	hawk in Ottawa	56
Bird Migration on Sable Island..	119	A Short Introduction to some	
Notes from Central Ontario ..	87	of our Common Birds....	95, 143
Boremys, A new Chelonian Genus		Elliott, Robt., Extracts from the	
from Alberta	232	Diary of	173
Botanical Branch, Meetings		Entomology, Popular	48
of	124, 201, 234	<i>Epigaea repens</i> , The Fruit of	110
Bouteiller, Jas., Bird Migration		<i>Erythronium albidum</i> , Notes on..	68
on Sable Island.....	119	<i>Esperella Bellabellensis</i> , Lambe.	14
British Columbia Mammals,		<i>Eupithecia Youngata</i>	225
Notes on	200	Excursions	88, 91, 142, 157, 158
Butterfly, The Clouded	59		

PAGE	PAGE
Fernald, M. L., A New Antennaria from Eastern Quebec.. 156	Lambe, L. M., A New Marine Sponge from the Pacific.... 14
An alpine variety of <i>Cnicus muticus</i> 166	Descriptions of New Species of Testudo and Baëna 188
A New Goldenrod from the Gaspé Peninsula 167	Boremys, A New Chelonian Genus from Alberta..... 232
Field Work at Summer School for Teachers 111	Leaves, The Swan Song of 197
Fletcher, James, The Clouded Butterfly..... 59	Lemieux, E. E., Notes on the Fauna and Climate of the Lièvre River 123
Note on <i>Erythronium albidum</i> 68	Lièvre River, Notes on the Fauna and Climate of 123
The Fruit of <i>Epigaea repens</i> .. 110	Ling, The Eggs of the Fresh-water 219
Rare Ottawa Plants..... 110	Lochhead, W., Nature Observations at Home 179
Fly Agaric, The 203	
Frozen North, A Naturalist in the..... 80, 104, 115	Macoun, John, Two Rare Fungi. 178
Fuller, Geo. D., The School Garden and the Public Schools.. 235	Maccun, W. T., Why our Field and Roadside Weeds are introduced Species..... 124
Fungi, Two Rare..... 178	Mammals, Notes on some British Columbia 200
Geological Branch, Report of... 209	McOuat, M. E., The Swan Song of Leaves 197
Geological Society of America, Meeting of 171	Members, List of 4
Geometrid Moth from Ottawa, New to Science..... 225	Moore, W. H. J., The Red-breasted Nuthatch 139
Gibson, Arthur, Halisidota Tussock Moths..... 48	Moth, New Geometrid from Ottawa..... 225
<i>Sthenopis thule</i> at Ottawa 117	Mother Nature and her boys... 215
Woolly bear Caterpillars 159	Moths, Tussock..... 48
Glaciation of Mount Orford 52	Mouse, The Banded Pocket 69
<i>Gordius aquaticus</i> , L. 131	Mount Orford, The Glaciation of 52
Greene, E. L., On so-called <i>Silene Mensiesii</i> 163	Mushrooms, On the Food Value of Certain 44
A New Northern Antennaria.. 197	
Gulls, Note on Red-billed 88	Nature, Mother, and her boys .. 215
Gyrfalcons, Some New Canadian Records for 208	Nature Observations at Home.. 179
	Nature Study, Apparatus required for..... 75
Hair-eel, The 131	The School Time required for 21
Halisidota Tussock Moths..... 48	Nature Study Papers, 21, 59 75, 95, 111, 127, 143, 156, 179, 215, 235
Halkett, A., A Naturalist in the Frozen North 80, 104, 115	Nesting of the Nigh-hawk in Ottawa 56
The Eggs of the Fresh-water Ling..... 219	Night-hawk, Nesting of, in Ottawa..... 56
<i>Hydrachna sulcata</i> , The Eggs of 99	Normal School Summer Course, Field Work at 110
James Bay, Fresh-water Shells from..... 66	Nuthatch, The Red-breasted 139
Klugh, A. B., Request for Carices 72	
Bird Notes from Central Ontario..... 87	
Ontario Ornithological Notes.. 121	

PAGE	PAGE
Odell, W. S., Notes on Fresh-water Rhizopods	16
Ontario Ornithological Notes, Winter 1904-5	122
Birds New to	205
Orchids, The Cultivation of our Native	228
Orford, Glaciation of Mount	73
Ornithological Notes, Ontario..	121
Ottawa Plants, Rare	110
Pine, Nature's Method of Re-seeding	67
Popular Entomology	48
Prince, E. E., The Eggs of the Scarlet Water-mite	99
The Hair-eel	131
The Eggs of the Fresh-water Ling	219
Prince and Halkett, The Eggs of the Fresh-water Ling	219
Putman, J. H., Ottawa Summer School for Teachers.....	127
Red-billed Gulls, Note on	88
Report of Council.....	7
Report of Treasurer	13
Review	214
Rhizopods, Notes on Fresh-water	16
Robinson, John, On the Formation of Local Collections....	147
Sable Island, Bird Migration on	119
Saunders, W. E., Birds New to Ontario	205
School Garden and the Country School	235
School Time Required for Nature Study	21
Shells, Fresh-water, from James Bay	66
Notes on some Fresh-water, from the Yukon.....	63
Some New Localities for Canadian Land and Fresh-water	169
Shutt, F. T., On the Food Value of Certain Mushrooms.....	44
<i>Silene Mensziesii</i> , On So-called..	163
Sinclair, S. B., The School Time Required for Nature Study ..	21
Apparatus Required for Nature Study	75
<i>Solidago chrysolepis</i> , Fernald....	167
Sponge, A New Marine, from the Pacific Coast	14
Spreadborough, W., Notes on some British Columbia Mammals	200
<i>Sthenapis thule</i> at Ottawa	117
Summer School, Ottawa, for Teachers.....	127
Swallows and Swifts	143
Swifts, Swallows and	143
Taylor, Geo. W., A Geometrid Moth from Ottawa new to Science	225
Testudo, Descriptions of New Species	188
Treasurer, Report of	13
Tussock Moths	48
Water-mite, The Eggs of the Scarlet.....	99
Weeds, Why our roadside, are Introduced Species	124
Whiteaves, J. F., Notes on some Fresh-water Shells from the Yukon	63
Lists of Fresh-water Shells from James Bay	66
The Banded Pocket Mouse ...	69
Some New Localities for Canadian Land and Fresh-water Shells	169
Some New Records for Gyrfalcons.....	208
Woolly-bear Caterpillars	159
Zoological Branch, Report of ...	70

APRIL, 1906.

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CONTENTS.

	PAGE
1. Officers of the Ottawa Field-Naturalists' Club....	3
2. List of Members of the Ottawa Field-Naturalists' Club	4
3. The Report of the Council of the Ottawa Field-Naturalists' Club for the year ending March 20, 1906	7
4. Treasurer's Statement for the year ending March 20, 1906	14
5. Notes on an Interesting Collection of Fossil Fruits from Vermont, in the Museum of the Geological Survey of Canada, by H. M. Ami	15
6. On the Structure of Roots, by Theo. Holm.	18
7. A May Morning with the Birds in New Brunswick, by W. H. Moore.	22
8. <i>Spergula arvensis</i> , by Jas. M. Macoun . . .	24
9. Nature Study—No. 33, by S. B. Sinclair.	25

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THE OTTAWA NATURALIST.

VOL. XX. OTTAWA, SEPTEMBER, 1906.

No. 6

NOTES ON SOME LAND AND FRESH WATER SHELLS FROM BRITISH COLUMBIA.

By J. F. WHITEAVES.

(A.) *From the vicinity of the International Boundary, on and between the Similkameen River and the Sumas Lake and Prairie; collected by J. M. Macoun and W. Spreadborough in 1905.*

The specimens referred to in this list were collected by Mr. Macoun in his capacity as Naturalist to the International Boundary Commission, or by Mr. Spreadborough, who was his assistant.

Although the region that they collected in is part of the country traversed by Mr. J. K. Lord, when naturalist to a similar commission in 1860, no specimens of *Limnæa Sumassi*, Baird, or of *Physa Lordi*, Baird, were detected or recognized in any of their collections. In the case of the *Physa*, the water at the typical locality for it (Lake Osoyoos) was so high when Mr. Macoun and his colleague visited it, in June, that no fresh water shells of any kind were obtained there. And, in this connection it may be mentioned that good specimens of the large *Physa* from Meach's Lake, near Chelsea, that were long thought to be either *P. Lordi*, or a large form of *P. ancillaria*, have recently been examined by Dr. Dall and pronounced to be the latter. "These shells," he writes, in a letter dated May 11th, 1906, "according to Tryon and Haldeman, are typical *Physa ancillaria*, Say, except that they are larger than usual. One of the middle sized specimens exactly agrees with Tryon's figure."

The species with an asterisk prefixed to their names were kindly determined by Dr. V. Sterki.

PELECYPODA.

Anodonta Oregonensis, Lea. (1838).

Anodonta cognata, Gould, 1850.

Small lake at Hope, and Sumas Lake, W. Spreadborough ; several living and adult shells from each of these localities.

Sphærium tumidum, Baird.

Sumas Lake, W. Spreadborough ; a fine series of living specimens, in all stages of growth. This is the typical and only known locality for this well defined species.

**Sphærium (Musculium) Raymondi* ? J. G. Cooper.]

Sumas Prairie, W. Spreadborough, several specimens, most of which are very immature. Specimens similar to the larger ones, in the Museum of the Geological Survey of Canada, were collected at ponds between Quesnel and Stewart lakes, by the late Dr. A. R. C. Selwyn in 1875.

**Pisidium proximum*, Sterki.

Second summit west of the Skagit River, in a small pond at an altitude of 6,000 feet, W. Spreadborough ; many fine and adult living specimens.

**Pisidium Streatori*, Sterki. Var.

Third summit west of the Skagit River, in a small pond at an altitude of 6,000 feet, W. Spreadborough ; nineteen specimens.

**Pisidium variabile* ? Prime.

Sumas Prairie, W. Spreadborough ; six specimens.

Pisidium, sp. undetermined.

Peat bog near the Skagit River, J. M. Macoun ; eight specimens.

Pisidium, sp. undetermined.

In a marsh, Lake House, Skagit River, J. M. Macoun ; sixteen specimens.

GASTEROPODA.

Limnæa palustris, Muller.

Similkameen River, J. M. Macoun ; five specimens.

Limnæa desidiosa, Say. (Teste Dall.)

Sumas Prairie, W. Spreadborough ; many specimens.

Limnæa Vahliei? (Beck) Moller. Young.

Or *L. lepida*, Gould, young. Dall.

Sumas Prairie, W. Spreadborough ; twelve specimens.

Planorbis (Pierosoma) trivolvis? Say.

Sumas Prairie, and small lake at Hope, W. Spreadborough ; several immature specimens from each of these localities. These specimens are probably referable to *P. trivolvis*, but they may be young shells of *P. Rinneyi*, Tryon.

Planorbis (Menetus) opercularis, Gould.

Sumas Prairie, W. Spreadborough ; several specimens.

Planorbis (Menetus) opercularis, Gould,
var. *Centervillensis*, Tryon. Teste Dall.

Peat bog near the Skagit River, J. M. Macoun ; four specimens.

Planorbis (Torquis) vermicularis, Gould.

Marsh near Lake House, on the Skagit River, J. M. Macoun ; several living specimens.

Physa propinqua, Tryon.

Sumas Prairie, W. Spreadborough, seven specimens ; and Similkameen River, J. M. Macoun, six specimens. This is the *Physa heterostrophæ* of Baird, but apparently not of Say.

Physa gyrina, Say. Teste Dall.

Sumas Prairie, W. Spreadborough ; several specimens.

Physa Nuttalli, Lea. Teste Dall.

Sumas Prairie, W. Spreadborough ; thirteen specimens.

Zonitoides arboreus (Say).

Peat bog near the Skagit River, J. M. Macoun ; five specimens.

Euconulus fulvus (Draparnaud).

Peat bog near the Skagit River, J. M. Macoun ; one specimen.

Succinea Hawkinsi, Baird.

East bank of the Similkameen River, J. M. Macoun; four rather small but living specimens.

Succinea retusa, Lea.

Sumas Prairie, W. Spreadborough; several specimens. In the Museum of the Geological Survey there are similar specimens from Deer Park, B.C., at an altitude of 5,300 feet, collected by Professor Macoun in 1890.

(B.) *From Douglas, B.C., collected by W. Spreadborough in May, 1906.*

PELECYPODA.

Margaritana margaritifera (L).

Campbell's Creek; four perfect but rather small specimens.

**Pisidium* "*abditum*," or near.

Several specimens.

GASTEROPODA.

Planorbis (*Menetus*) *opercularis*,
var. *Centervillensis*.

Several specimens.

Polygyra Columbiana (Lea).

Two living and adult specimens.

Circinaria Vancouverensis (Lea).

One fine adult and living specimen.

(C.) *From various localities and collections.*

PELECYPODA.

Gonidea angulata (Lea).

Anodonta angulata, Lea. 1838.

This species has been recorded from British Columbia by Simpson and Dall, presumably because it is included in one of the lists of shells collected in that province by J. K. Lord in 1860. But, Mr. Lord's specimens are expressly stated to be from the Columbia River at Fort Colville, which, he says, is "not strictly

in British Columbia." It is not included in the Rev. G. W. Taylor's "Preliminary Catalogue of the Marine Mollusca of the Pacific Coast of Canada, with notes upon their distribution," in the Transactions of the Royal Society of Canada for 1895, though this paper gives a list of the land and fresh water, as well as of the marine shells of British Columbia, and quite recently Dr. Dall writes that he can find no specific record of *Gonidea* from that province in the United States National Museum.

In March, 1906, however, two dead but characteristic and separate valves, of shells that, in the writer's judgment, are clearly referable to this species, were presented to the Museum of the Geological Survey, by Mr. G. E. Winkler, of Penticton, who writes that he had recently found them "in the Okanagan River, near where it leaves Okanagan Lake, at Penticton." And, still more recently, in August last, he has collected and kindly forwarded, four perfect and adult, living but otherwise similar shells, from the same locality. This would seem to be the first definitely Canadian record for this well known California and Idaho species.

Pisidium Idahoense, Roper.

In the Museum of the Geological Survey there are two specimens, one perfect one and a single valve, of this species, which were collected at Fort George, "at the confluence of the Fraser and Nechacco rivers, B C.," by Dr. G. M. Dawson in 1875. This is a previously unrecorded locality for this apparently rather rare species.

GASTEROPODA.

Polygyra ptychophora (Brown).

Helix ptychophora, A. D. Brown, 1870.

In the same museum there are a few good specimens of this species, from the following localities in British Columbia. Elk River, in the Crow's Nest Pass, collected by J. B. Tyrrell in 1883; Sproat, collected by Professor Macoun in 1890; and Trail, collected by W. Spreadborough in 1902.

Dr. Dall writes that similar specimens from Mission Junction (43 miles east of Vancouver, on the main line of the Canadian Pacific Railway) have recently been received at the United States National Museum.

EXTRACTS FROM THE DIARY OF THE LATE ROBT. ELLIOTT.

(Continued from Vol XIX p. 178.)

Aug. 17. At edge of wood opposite Mossey Cup Island I found in a small rotten stub, nest of flying squirrel; the female and four young about half grown. Nest five feet from ground in abandoned woodpecker's or blue-bird's hole, filled with fine bark strips. The mother came out, passed to top of stub and descended to foot of nearest tree. While I was examining young she came close to hole but again crawled to the top and passed away as before.

Aug. 29. Examined stomach of racoon; killed about 10 P.M. in corn patch. Contents 2-3 green corn, 1-3 insects, chiefly black beetles, but some red-legged locusts. In addition there was about 30 white worms, round, thickness of a knitting needle and about 1 1-2 to 2 inches long. Preserved three. Order Rematidea.

Sept. 1. Fine, cloudless day. Saw alighting on dry, ploughed ground about sixty golden plover. When they rose and circled many times in the air, each time rising higher, they formed an exceedingly beautiful sight, especially when in turning, the sun was reflected in metallic opalescence.

Sept. 13. Found *Botrychium lunarioides*, perhaps var. *obliquum*, at Gough's. The Plover Mills *Veronica* is probably *V. agrostis* but Gray says it is one to two seeded while this is eight to twelve.

Nov. 14. At Foster's saw six grouse, one woodcock and one quail. The last named is now quite scarce in this neighborhood. Mr. F. gave me one egg of whippoorwill which he found in leafy woods in June. There was another one which he left. This one has rather small lavender spots upon a white ground. It is somewhat abnormal on account of the spots.

Dec. 15. The bird shot by Mr. A. Ralph, of sixth concession, London Township about Nov. 15th last is very probably the blue goose, *Chen caerulescens* (Linn). This is important and must not be overlooked.

Jany. 3, 1899. R. James and Jos. Smith heard one frog in swamp today. Very mild. I looked a great many places, under rotten logs, etc. for salamanders but found no traces of them.

Jany. 8. Picked off a thorn tree remains of a vole, probably left there by northern shrike.

Jany. 24. Hoar frost. Very warm today. Saw one light colored shore lark on the road (First).

Jany. 31. H. Karm, near Embro, in chopping a hollow tree came across eleven coons (*Procyon lotor*) in the interior; eight were killed, three escaping.

March 8. Saw J. W. digging two skunks out of a burrow in sandy soil, in open woods near river. They were in a nest of dry leaves about 2 1-2 feet from surface, male and female—the latter smaller and fatter than the other. Examined the stomachs; that of the male contained two or three withered leaves, and mixed with them, hairs of (probably) voles. There were also a large number of worms, parasites, numerous very small ones, and half dozen or so larger ones, one inch long. The female's stomach contained nothing but numerous small worms in mucous. W. told me that the greatest number of skunks he ever found in a burrow was eleven; but said that a man he knew once ran a fox into a hole and on setting a trap at the mouth he caught fifteen full grown skunks in as many consecutive nights and on the sixteenth he caught the fox. W. also stated that at one time during winter he dug a skunk out of a nest and found a woodchuck close beside it in a nest of its own. The latter was curled up and in a state of torpor, it awoke on the snow.

March 18. Saw a redtailed hawk and tiger beetle. Is the water bear (*Tardigrada*) really a depauperate arachnidian? Saw caddis fly larva for first time in same pool with *Branchippus stagnalis*. Pickering's tree toad croaking in pools for first.

March 19. Many Pickering's tree toads out. Saw two small garter snakes on dry knoll at edge of pool. Saw the first Camberwell beauty at edge of woods.

March 21. Saw a white-footed mouse in hole (natural scar) of small green beech. Nest of thistledown. A large mass of shelled beechnuts were lying at foot of tree. The margin of

the hole on the outside was partly eaten away by (I believe) some larger mammal; probably to get at the little white-foot. It was quite tame but would bite a little at a twig inserted and once struck at it with its front feet.

March 25. At Model. *Skunk cabbage in full bloom. The spathe is shell-like and very pretty, being variously streaked with purple and yellow. The whole plant has a strong skunk-like odor, no doubt a defense to the large tender plant in the struggle for life in places overrun by herbivorous animals. The blossom precedes the leaves—and is very early—the only available time the plant has found to catch the eye of the fertilizing bees.

March 28. Froze hard last night. Slight snow fall, quite cold A. M. Birds hard put. P.M. sun out, snow melted.

April 1. Five or six inches of snow. Winter once more. Birds are surely hard put.

April 3. Cloudy and mild. Snow disappearing. Saw four or five killdeer running at a creek edge querulously calling.

April 4. Froze hard last night, rather mild today. Saw at edge of muddy road what I took to be a Wilson snipe, although apparently rather small. It lit on a rail fence and allowed me to approach within thirty-five yards, then flew with the irregular snipe-flight, and at the moment of rising uttered a characteristic bleat.

April 5. Fine, A. M. Vesper sparrow singing for first time, Saw phoebe at Crozier's Creek. P.M. Snowing heavily, and high wind from north. As I rode fifteen miles in the teeth of the storm I had a clearer view of the struggle for existence.

April 6. Snow 6 inches deep on the level and high drifts beside. All this snow fell since yesterday noon. This morning is calm and mild with a strong sun shining, and no doubt, the snow will rapidly pass away, surely none too soon for the poor birds. Saw part of the skin with a few feathers, of a small bird on thorn at edge of side road. A shrike had dined well and

*NOTE.—“The Model” to which Mr. Elliott refers so frequently in his Diary was an abandoned farm with swampy woods and an old neglected orchard which furnished the best possible ground for the botanist and ornithologist. With his gentle satire he christened it the “Model Farm.”

some little songster suddenly ceased to sing. Saw flicker in maple at edge of orchard; also another on ant hill eating a medium-sized ant with brownish head and thorax, and black abdomen. Think of the storm last night and the hot sun today. When the ant hill is bare of snow the inmates sally out, the hungry flicker comes, and the great question is who is to live. How eagerly the ants were working to clear away debris! How pretty the flicker's plumage in the light of the western sun!

April 7. Watched pileated woodpecker digging its nest in a high stub at 10 A.M. Noticed the bird at the same hole on March 17; nest was well dug out at that time. Now, last year, I saw a hole in the winter which was afterwards used by the pileated for an nest. Does this bird use the winter roosting place as a nest for the ensuing season, and are their nests occupied for more than one season? The yellow-shafted flicker does this.

April 8. Visited Gough's in the evening. Many signs of spring, the more notable being blossoms of *Erigenia bulbosa*, *Claytonia* and *Hepatica*. What delicate odors and most exquisite tints these early nurslings of April show! Near the spot where the Harbinger of Spring starred the gray knolls, a male chewink cheerfully sang; another answered him from a neighboring copse. Heard a W. R. shrike singing a feeble song on top of a high elm.

April 9. Captured a specimen of the butterfly *Grapta j-album*. Saw three individuals at different places and followed one a long distance but owing to its very rapid flight it escaped. How perfectly the under side of its wing assimilates with the grey of decayed leaves and wood. When the wings are closed it is very difficult to make it out among dead leaves, and no doubt by this means it often escapes the notice of sharper eyes than mine, viz:—those of the keen and hungry birds.

April 10. I walked one and half miles along the river from Model to Plover Mills. It was very pleasant, the bright sun was setting at the head of a long ravine, the moon overhead was slowly gathering light, and on the opposite side of the singing river, half way up a wooded slope, a bright fire was burning in a sugar

camp. What a restful rural sight! The birds were fairly bubbling over with melody, the sweet vesper sparrows, perhaps, carrying off the palm.

April 11. Heard a brown creeper gaily singing as he wound around a mossy ash. Saw two black squirrels chasing each other round the dead top of a tall maple. A flying squirrel came out of a hole and descended gracefully to a bass-wood stub nearby. On striking the stub the squirrel went down to a brush heap. On agitating this it crawled to the foot of a beech and going to the top, passed to the foot of its home tree and so back to the nest.

April 14. Today Dirca doffs the brown fur cap he wore throughout the winter and gaily shakes his golden forelocks in the sun. Saw four red-backed salamanders. Hylas are incessantly harping in the pool.

April 23. A ruffed grouse built its nest among beech leaves in a brush pile, a hen had a nest four feet from it. The first egg laid by the grouse was accidentally destroyed by a person going to the hen's nest. The grouse then laid in the hen's nest and they have laid five eggs apiece.

May 3. Saw ruffed grouse making its nest near the ridge.

May 6. Followed the "Peeper"—little tree toad, (*Chorophilus triseatus*.) Owing to some ventriloquial power the creature is hard to locate. I found this individual on the grass, on the edge of a pool with its throat much inflated, peeping vigorously, and occasionally uttering a gurgling trill of longer duration.

May 7. Exceedingly warm, quite like June, leaves bursting on every side. What a keen delight is afforded the one who takes a wood-walk today. Butterflies glancing and pirouetting over the blossoms, bees on the Claytonias and Violets, the juneberry hanging her graceful leaves on the forest's skirts, squirrels chattering and birds bubbling over with song. An irresistible march onward of nature's various forces.

June 5. Father saw dead *Procyon lotor* (raccoon) in pasture. I saw live *Mephitis mephitis* in woods. At sight of me it retreated to burrow in a knoll and on my standing still it re-

turned near me and foraged assiduously among leaves and rubbish apparently for beetles. It frequently dug an inch or two after its prey. No smell was noticeable. The most surprising thing connected with this animal in the woods is the enormous size of its tail.

June 15. Visited the carp pond and on the trees around it large numbers of *Hyla versicolor* were trilling musically. I captured four, three of them greyish and one greenish. I watched them for an hour in the bottle and noticed that the greenish one, (the largest) was the only one that trilled, the others merely offering a soft chic, chic, chic. The greenish one was the only one attempting to copulate with the other ones. It was certainly a male and I presume the others were females. I am not aware that sexual distinction is connected with the color of this very variable species; but there is a clear difference in the notes of the sexes. This is interesting. I also noticed that after handling these viscid hylas and accidentally rubbing my eyes I felt a smarting that lasted for twenty minutes or so. I suppose no bird or mammal finds them at all palatable. I would like to offer one to *Procyon lotor*, who greedily devours the Ranas.

June 19. The afternoon turning out fine I had the choice of going to a picnic or to the Model. The winds whispered in the beeches, and I went to the latter alone save for the buzzing thoughts that hummed through my head. Splashing through the swamp there, I came half unaware on a magnificent group of *Cypripedium spectabile*, and I did not envy Wordsworth with his heart dancing with the daffodils. Seventeen blossoms had opened out, the peerless flowers all perfect as one could wish, purple and pink fading invisibly into immaculate white—these boats floated in the ethereal air waiting for some dainty Ariel to set a filmy sail above them, and ready to waft them whither he wished. Or indeed it may be (so dull are mortal senses) that they were mocassins fashioned by the patient worker, Nature, for some fairy Indian maiden, for her wedding hour by the light of the full moon this very midsummer night. Be all this as it may, a portion of this beauty pierced deep through my eye and down to my heart. A swamp sparrow brooded on her eggs near by, and a veery filled the woods with his clingle clangle, a silver bell

with a golden tongue. Coming down to Plover Mills with four of the fairy boats what voyageur ever made a lighter portage? There, R. Y. had caught for me a Menobranchus and no stronger contrast could be found in nature than was presented between the burden of my right hand and of my left, in one a glorious flower, in the other a hideous amphibian.

The Menobranchus measured 11 3-4 inches; it was rather dark brown on the back with five lighter brown blotches and some large very dark brown spots all over the back and sides; abdomen yellowish brown with a few spots along the centre. The gill tufts (three pairs) had dark brown ends with blood red bases at the gill orifice; four toes on each foot; upper lip slightly overlapping the lower; many small teeth on palate, tongue large but short; head measured one and half inches in length; body from fold of throat to vent five and half inches; tail 4 inches. Is this *lateralis* or *maculata*? It seems to be the latter but it is *lateralis* that Dr. Brodie has. Dr. Garnier mentions another species which he describes as rare, namely *M. Huronense* which is said to be about one foot long, deep sooty brown on back, lighter beneath, throat white, upper jaw hooked over the lower. This seems to agree pretty well with mine. Concerning my specimen I should note that it was caught on a hook baited with earth worm; this was about 3.30 P.M.; the water was very dirty and the river high owing to recent rains.

June 28. At the head of Plover Pond I was looking at a red squirrel at foot of maple and black squirrel close to a nettle tree. The dog Dash made a run for the squirrels when I noticed a great blue heron rise from the shore; and closer, and of much more interest, a female merganser moving out into the water making a quacking sort of a sound. She then flew south half a mile and presently returned. While watching the squirrels I thought I noticed something like a large bird fly down from a dead tree close by the shore and the idea took hold that the bird may be breeding there. This is worth attending to. I resume the hooded merganser is the most likely species to be found here.

BIRD MIGRATION, 1905.

OBSERVATIONS MADE ON SABLE ISLAND, NOVA SCOTIA,

By JAMES BOUTEILLER.

Name of Species.	When First Seen.	Number Seen.
Ringneck Plover ..	April 23.....	One.
Common Arctic Tern	„ 27.....	A few.
Flicker	„ 27.....	One.
Junco	„ 30 ..	Several.
White-throated Sparrow	May 3	One.
Red Phalarope.....	„ 4.....	One.
Greater Yellow-legs	„ 6.....	About a dozen.
Least Sandpiper	„ 8.....	One.
American Pipit	„ 12.....	One.
Roseate Tern	„ 13.....	In numbers.
Great Blue Heron	„ 18.....	One.
Henslow's Sparrow	„ 18.	Several.
Spotted Sandpiper	„ 22.....	One.
Red Phalarope.....	„ 22.....	In large flocks.
Spotted Sandpiper ...	„ 25.....	In numbers.
White-crowned Sparrow	„ 25. . . .	In numbers.
Shore Lark	„ 25.....	One.
Pine Warbler	„ 28.....	One.
Wilson's Phalarope	June 7.....	One. First one ever seen here.
Pine Siskin ..	„ 16.....	One.
Yellow Warbler	„ 25.....	One.
Crossbill, American ..	„ 25.....	One.
Greater Yellow-legs	July 10.....	Two.
Wilson's Snipe	„ 13.....	Six.
Swallows	Aug. 9.....	Four.
Yellow Warbler ..	„ 9.....	One.
Greater and Lesser Yellow-legs..	„ 10.....	In numbers.
Pectoral Sandpiper.....	„ 10 ..	Several.
Turnstone Plover	„ 10....	In numbers.
White-rumped Sandpiper	„ 11.....	Several.
Black-bellied Plover	„ 20	In numbers.
White-rumped Sandpiper	„ 20.....	In numbers.

Name of Species.	When First Seen.	Number Seen.
Swallows	„ 20.....	In numbers.
Golden Plover.....	„ 20.....	Several.
Bartramian Sandpiper	Sept. 8.....	One.
Buff-breasted Sandpiper.....	„ 12.....	One. First one I have ever noticed here.
Black and White Warbler	„ 12.....	One.
Cedar Waxwing	„ 12.....	One.
Pipits.....	„ 16.....	In numbers,
Flicker	„ 16.....	One.
Palm Warbler	„ 16.....	In numbers.
Pine Warbler	} * See foot note.	Several.
Chimney Swift.....		One.
White-throated Sparrow		Several.
Osprey ..		One,
Fox Sparrow ..		One
Kinglet ..		One.
Rusty Blackbird		In numbers.
Myrtle Warbler		In numbers.
Black-throated Green Warbler..	Oct. 7.....	One.
Various Hawks and Sparrows ..	„ 7 ...	In numbers.
Fox Sparrow	„ 7.....	In numbers.
Kinglet	„ 7.....	Several.
Black-throated Blue Warbler ..	„ 7.....	One.
Junco	„ 16.....	Several.
Fox Sparrow ..	„ 20.....	Several,
Hermit Thrush	„ 22.....	One or two.
Killdeer Plover ..	„ 22.....	One.
Long-tailed Squaw.....	„ 25.....	In numbers.
Black Creeper...	„ 25.....	One.
White-winged Scoter...	„ 25.....	In numbers.
Baldpate	„ 28.....	In numbers.
Woodpecker ..	„ 31.....	One.
Junco	Nov. 12.....	About a dozen.
Robin	„ 22.....	Several.

*All came during N. W. blow which lasted for two or three days beginning 30th September.

Name of Species.	When First Seen.	Number Seen.
Snowy Owl	,, 25	About a dozen.
White-winged Scoter	Dec. 1	In numbers.
Sheldrake	,, 22	In numbers.
Bluebill	,, 22	In numbers.
Northern Shrike	,, 22	One. Has been here about a month.
Shore Lark	Jan. 6	Three.

MEETINGS OF THE ENTOMOLOGICAL BRANCH.

A good meeting of the Entomological Branch was held at Dr. Fletcher's apartments on the evening of March 23, at which 8 members were present. The chairman exhibited some rare butterflies taken in the Yukon Territory by Mr. Jos. Keele, and by Mr. W. J. Wilson, both of the Geological Survey. Among those taken by Mr. Keele, the most remarkable were *Erebia magdalena* and *Eurymus boothii*.

Mr. Harrington exhibited his collection of *Dytiscidae*, all of which had been recently examined by Mr. J. D. Sherman, Jr., of New York. This collection contains 50 species from Ottawa and will be of great value to local coleopterists in naming their specimens of this little-worked family. There were 7 species which could not be named.

Mr. Gibson showed a fine specimen of *Sthenopsis thule* taken by him on July 6 last. This is the first authentic record of this rare moth ever having been taken at any other place than Montreal, the type locality. Mr. Gibson also showed a leaf of an *Ixia* from the greenhouse at the Experimental Farm which was thickly matted with the dead bodies of a species of aphid, every specimen of which had been destroyed by a minute Chalcid parasite, and read a note on the behaviour of the parasite when stinging its victims.

Mr. Young exhibited a series of nine specimens of *Eucosma solandriana*, showing a remarkable range of variation. These

had all been taken by him about the lower branches of *Ostrya Virginica* in July and August last.

Mr. Baldwin exhibited a specimen of the West Indian moth *Melipotis fasciolaris* taken by him in Ottawa last summer and read a note upon its capture.

Mr. Metcalfe showed 13 species of orthoptera, all taken at Ottawa.

Mr. Halkett showed some parasitized pupae of various kinds from his collection.

Mr. Wilson gave an account of the country he was exploring last summer in the Temagami district.

A copy of Dr. E. P. Felt's sumptuous memoir *Insects Affecting Park and Woodland Trees*, Volume 1, was laid on the table and was much admired by all present.—J. F.

Held at Mr. Gibson's, 20th April. Messrs. Halkett, Fletcher, Harrington, Keele, Metcalfe, Baldwin, Newman and Gibson present.

Mr. Halkett exhibited living specimens of the nymphs of some May-flies and Stone-flies which he had collected from the Rideau river. He said that he had found these in thousands, near St. Patrick's Bridge, swimming up the river against the current. He also showed one of the curious cases, with the larva inside it, of a caddis-worm.

Dr. Fletcher spoke of an interesting occurrence at Ottawa, in very destructive numbers, of a tineid caterpillar. This minute larva is at present working inside the tips of white cedars, killing many twigs and giving the trees a very unsightly and unhealthy appearance. Specimens of the work of this minute insect were examined. Dr. Fletcher also showed some living parasites, *Pteromalus puparum*, reared from the chrysalids of the Common White Cabbage Butterfly. Mr. Harrington mentioned that he had found the cases of *Coleophora laricella* in large numbers on wild trees of *Larix Americana* at several places in the Ottawa district. A living specimen of *Meloe niger*, one of the first insects to appear in the spring, was also shown by Dr. Fletcher.

This species is as a rule rather rare in collections but is always common at Ottawa.

Mr. Harrington exhibited a collection of 11 species of *Andrena* taken at Ottawa and Toronto, which had recently been critically examined and named by Mr. Vierick, of Philadelphia. He also showed a perfectly fresh specimen of *Scolecopharyx libatrix* which he had caught the day before. He was under the impression that the specimen must have recently emerged from the pupa. There was some discussion on the winter habits of the species, which branched off into the abundance of some *Vanessians* last autumn and this spring. There was reason to hope that *Vanessa j-album* might this year be again abundant and all members were urged to try and secure eggs of this species so that the full life-history might be worked out.

Mr. Metcalfe showed some living larvæ of *Leucania comoides*, and also one of a species of *Crococa*, as well as a small collection of micros taken in Toronto and mounted by himself.

Mr. Baldwin exhibited a fine specimen each of *Apantesis celia* and *virguncula*, which had been taken by him during last season. Both of these moths are rare in this locality.

Mr. Newman spoke of the injuries by the larvæ of *Grapholitha interstinctana* to the clover seed crop in Ontario. He had found the larvæ very abundant in Victoria, Durham, Peterboro and Prince Edward counties.

Mr. Gibson showed some specimens of a *Coleophora* found this spring upon the heads of Yarrow and also some yellow larvæ of a moth hibernated in the dry stems of *Oenothera*. Larvæ of *Penthina hebesana*, in the heads of mullein were also exhibited.—A. G.

CORRECTION.

On page 107 of the last issue of the OTTAWA NATURALIST *Pachystima Myrsinites* and *Pachystima macrophyllum* were by the printer marked "sp. nov." after the last proofs had left the editor's hands. The former of these species was described by Rafinesque the latter by Miss Farr.

REVIEW.

MOSESSES WITH A HAND-LENS AND MICROSCOPE. A NON-TECHNICAL HAND-BOOK OF THE MORE COMMON MOSESSES OF THE NORTH-EASTERN, UNITED STATES. By A. J. Grout, Ph. D. Parts I, II and III, published by the author, 360 Lenox Road, Brooklyn, N.Y. \$1.00 a part.

In his preface Dr. Grout says : " Mosses are individually so small and inconspicuous that the effect which they have as a mass in creating and enhancing the beauty of natural scenery is often overlooked," and as he later points out many would have collected and studied them had not the difficulties been so numerous and hard to overcome. It is to lessen the number of these difficulties that " Mosses with a Hand-lens and Microscope " has been published. A short review of " Mosses with a Hand-lens " was printed in THE NATURALIST a few months ago. Useful as that book is to young students it cannot compare in value with Dr. Grout's later and more exhaustive work. The same methods have been used but the hand-lens being replaced by the microscope it has been possible to refer to many microscopic distinctions that could not be detected at all, or only with great difficulty, by a hand-lens. Though purporting to be only a hand-book of the mosses of the northeastern United States, nearly all eastern Canadian species are included.

The first 46 pages of Part I are divided into (1) Introduction (2) Classification and Nomenclature. (3) The Collection and Preservation of Mosses. (4) How to mount Mosses. (5) Methods of Manipulation. (6) Life-History and structure of the moss plant. (7) Illustrated glossary of bryological terms. The description of species and the characterization of genera and orders is so exact that any one familiar with moss terminology should have little difficulty in determining the species he collects.

Heavy coated paper, new type and illustrations without number add to the value as well as the appearance of what must be considered the most important work that has yet been published on American mosses. No other book will be needed by any moss-student except the specialist.

JOHN MACOUN.

CT 2619
OCTOBER, 1906.

VOL. XX, No. 7

34
1
133
THE

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CONTENTS.

	PAGE
1. Notes on <i>Cyrtoceras cuneatum</i> , by J. F. Whiteaves....	133
2. Contributions to Canadian Botany, by James M. Macoun....	135
3. The Spring Migration of Birds at Ottawa of the year 1906, compared with that of other seasons, by C. W. G. Eifrig	144
4. Nature Study—No. 37—by Arthur Gibson.. . . .	149

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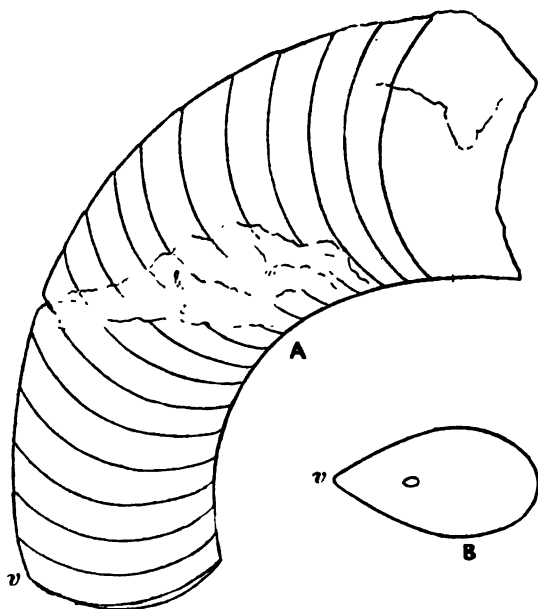
VOL. XX.

OTTAWA, OCTOBER, 1906.

No. 7

NOTES ON CYRTOCERAS CUNEATUM.*

By J. F. WHITEAVES.



Cyrtoceras cuneatum, A. Side view of the type and only known specimen of this species, in outline only. B. Smaller end of the same, also in outline. Both figures are of the natural size, and in both *v* is the venter.

This species was based upon a single specimen from the Silurian rocks at Stonewall, Manitoba, collected by Mr. D. B.

*Communicated by permission of the Director of the Geological Survey Department.

Dowling in 1902, and now in the Geological Survey of Canada. It was described by the writer in the fourth and last part of the third volume of "Palæozoic Fossils," recently published by the Survey, but it was not illustrated, as the type and only known specimen was unfortunately mislaid.

This missing and previously unfigured type has since been found, and it is now practicable to give two illustrations of this interesting specimen, and to slightly amend the original description of the species.

In regard to the two foregoing text figures of *C. cuneatum*, the explanations given below them may be supplemented by the following remarks. The specimen is a cast of the interior of part of the septate portion of the shell, with sixteen of the chambers preserved, and of a small piece apparently at the commencement of the body chamber. Figure A shows both the arcuate contour of the fossil, and the widely and shallowly concave lobe of each of the sutures, as viewed laterally. Figure B, on the other hand, shows the lateral compression, the ovate cuneate transverse section, as seen in an end view of the smaller end of the specimen, the narrow venter, and the apparently eccentric position of the siphuncle.

The original description of the species may be slightly and briefly amended, so as to read as follows:

"Shell widely arcuate, strongly but rather obliquely compressed, very narrow on the periphery or venter, much wider but narrowly rounded on the dorsum, the outline of the transverse section being ovate cuneate, and the lateral diameter to the dorso-ventral about as three to five.

"Septa averaging about six millimetres apart laterally, the sutural lines being shallowly concave on both sides and produced into a narrow pointed saddle on the venter." Test unknown. Shape and position of the siphuncle not very clearly defined in the only specimen collected, though at the smaller end thereof there are indications that it was eccentric and placed a little on the ventral side of the centre, as represented in figure B.

The shell is "evidently not a true *Cyrtoceras*, but a probably new generic type, which there is not yet sufficient material to define satisfactorily."

CONTRIBUTIONS TO CANADIAN BOTANY.*

By JAMES M. MACOUN, Assistant Naturalist, Geological Survey of Canada.

XVII.

Since the last of these papers was published a great many species have been added to the list of those known to occur in Canada ; the distribution of others has been greatly extended and a large number of notes worthy of publication have accumulated in our herbarium. Much of this material will be utilized in publications which will be issued from this Department at an early date but it is hoped to print from time to time in THE OTTAWA NATURALIST records that might not find a place elsewhere. Some of these records have appeared in other publications, but as these notes are intended primarily for Canadian workers not all of whom have access to current botanical literature, and in nearly every case new information as to distribution has been added, it has seemed best to make the record as complete as possible by including some matter that has been published elsewhere.

DICKSONIA PILOSIUSCULA, Willd.

In sandy woods, Courtland, Norfolk Co., Ont., 1901.
(*John Macoun.*) Rare in western Ontario.

ASPLENIUM RUTA-MURARIA, L.

On limestone rocks, north end of Manitoulin Island, Georgian Bay, Ont. Collected by Dr. Scott of Southampton, in 1901. New to Canada.

ADIANTUM PEDATUM, L., var. ALEUTICUM, Ruprecht.

A. pedatum, Cat. Can. Pl., II : 263 in part.

Represented in our herbarium by four sheets of specimens, all collected on Mt. Albert in the Shickshocks, Gaspé, Que. Two of these sheets were collected by Prof. John Macoun in 1882, and two by Messrs. Collins and Fernald in 1905.

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EQUISETUM LAEVIGATUM, Braun.

Roadsides at Windsor, Ont., 1902. No. 66,396, (*John Macoun*.) Not recorded from eastern Canada.

SPARGANIUM FLUCTUANS, (Morong) Robinson, Rhodora. VII : 60.
S. androcladum, var. *fluctuans*, Cat. Can. Pl., II : 70.

The only Canadian locality cited by Dr. Robinson is Lake Memphremagog, Que. Our specimens are from Campbellton, N.B., No. 28,052*, (*Chalmers*), Lake Mistassini, Que., No. 28,053, (*J. M. Macoun*) and Great Opeongo Lake, Algonquin Park, Ont., No. 22,562. (*John Macoun*). It was reported by J. M. Macoun from Severn River, Keewatin.

PANICUM PHILADELPHICUM, Bernh.

P. capillare, L., var. *flexile*, Gattinger.

P. flexile, (Gatt.) Scribner.

On sand, southern point of Pelee Point, Lake Erie, Ont., July 28. 1892. Referred at the time to *P. capillare*; by marshes, Sarnia, Ont., Herb. No. 26,332, and on Birch Island, Lake Huron, No. 26,331. (*John Macoun*.) Pelee Point, Lake Erie, Sept. 7th, 1905, growing among *Juniperus Virginiana*. (*A. B. Klugh*.)

TRISTETUM MELICOIDEUM, (Mx.) Vasey.

Grapphorum melicoides, Cat. Can. Plants II : 228 in part.

Woodstock, N.B., No. 22,687; Madeline River, Gaspé, Que., No. 29,481. (*John Macoun*.) Aroostook River, N.B. (*Williams, Collins and Fernald*.) Ste. Anne des Monts River, Gaspé, Que. (*O. D. Allen*.)

TRISTETUM MELICOIDEUM, (Mx.) Vasey, var. COOLEYI, (Gr.)

Scribn., Rhodora, VIII : 87.

Grapphorum melicoides, Cat. Can. Plants II : 228 in part.

Little Cascapedia River, Que. (*Collins, Fernald and Pease*.) River de Brig, Anticosti, Que., No. 29,479; Chelsea, Que., No. 61,297; Hastings Co., No. 29,482; Johnstone's Harbour, Lake Huron, Ont., No. 26,222. (*John Macoun*.) Galt, Ont. (*W. Herriot*.) Fishing Islands, Lake Huron, Ont. (*J. Bell*.)

*Specimens have been distributed from the herbarium of the Geological Survey under these numbers.

AVENA STRIATA, Michx. forma **ALBICANS**, Fernald, Rhodora, VII: 244.

A. striata, Cat. Can. Pl. II: 213 in part.

Distinguished from the species only by its pale, straw-colored glumes. Collected on Mount Albert, Gaspé, by John Macoun in 1882, No. 30,085. Described from specimens found at the same place and at Bic, Que., by Messrs. Fernald and Collins in 1904 and 1905.

BROMUS JAPONICUS, Thunb.

B. patulus, Mert. & Koch.

Collected at Toronto, Ont., by Mr. W. Scott and called *B. squarrosus* to which it is very similar. Mr. Scott's specimens differ from typical *B. Japonicus* in their short-rayed panicles. Introduced. New to Canada.

SCIRPUS VALIDUS, Vahl.

S. lacustris, Cat. Can. Pl., II: 99 in part.

Sable Island, N.S., 22,633. (*Macoun.*) Campbellton, N.B., 32,359. (*R. Chalmers.*) Ottawa, Ont., 7,541; Chelsea, Que., 61,187; Niagara Falls, Ont., 34,583; Algonquin Park, Ont., 21,906; Lake Nipigon, Ont., 32,357. (*Macoun.*) Edmonton, Ont., 25,344. (*Jas. White.*) Grassy Narrows, Lake Winnipeg, 32,356. (*J. M. Macoun.*) Brandon, Mau., 16,407; Sage Creek, Sask., 16,410; Cardston, Alta., 68,933; Cypress Hills, Alta., 16,409. (*Macoun.*) An abundant and widely distributed species not represented in our herbarium from west of Alberta.

SCIRPUS OCCIDENTALIS, (Watson) Chase, Rhodora, VI: 68.

S. lacustris, Cat. Can. Pl. II: 99 in part.

S. lacustris, var. *occidentalis*, Wat.; Cat. Can. Pl. II: 100.

Brackley Point, P.E. I., 32,360; Annapolis, N.S., 32,358; Grand Narrows, Cape Breton Island, N.S., 20,772; Sarnia, Ont., 34,582. (*Macoun.*) Toronto, Ont. (*W. Scott.*) Skull Creek, Crane Lake, Sask., 7,540; Prince Albert, Sask., 16,408; South Saskatchewan River, 32,361; Kananaskis, Rocky Mountains, 32,362. (*Macoun.*) Canoe River, head of Columbia River, Rocky Mts., 20,773. (*W. Spreadborough.*) Widely distributed in British Columbia but seldom collected.

S. occidentalis is distinguished from *S. validus* by achenes $\frac{1}{3}$ larger, by scales $\frac{1}{4}$ — $\frac{1}{3}$ longer than the achene and nearly twice as long as the scales of *S. validus*, viscid-pubescent, overlapping $\frac{1}{2}$ their length or more; by the cylindric more densely fruited spikelets in capitate clusters; and by the denser umbels and harder culms.

SCIRPUS HETEROCHÆTUS, Chase, Rhodora, VI : 70.

Distinguished from *S. validus* and *S. occidentalis* by the 3-cleft style, by the triquetrous achene, by the fragile bristles, fewer and shorter. An apparently rare species in the United States and not yet recorded from Canada. Mr. Ezra Brainerd found the three species growing in Lake Champlain where *S. occidentalis* begins to ripen seeds about six weeks later than *S. validus*; *S. heterochætus* flowers there at a date midway between the two.

RHYNCHOSPORA CAPILLACEA, Torr., var. LÆVISETA, Hill.

In bogs at Southampton, Ont., Aug. 20th, 1901, No. 34,573. (*John Macoun*.) Wet sand along the shore of Lake Huron at Oliphant, Ont. (*A. B. Klugh*.)

CAREX KATAHDINENSIS, Fernald, Rhodora, II : 171.

Collected by Prof. Ezra Brainerd at the "Grand Discharge" of Lake St. John, Que., Aug., 1901.

JUNCUS BUFONIUS, L. var. HALOPHILUS, Buch. & Fernald, Rhodora, VI : 39

Mr. Fernald records this variety from Riviere du Loup, Que., New Carlisle, Que., Bonaventure River, Que., and from Tracadie Beach and beach near Summerside, Prince Edward Island. Our only herbarium specimens are from Grand Narrows, Cape Breton Island, N.S., 20,708, (*John Macoun*), and mouth of Dartmouth River, Gaspé Co., Que. (*Collins, Fernald and Pease*.)

ALLIUM RECURVATUM, Rydb.

Confounded with *A. cernuum* of the east Differs from *A. cernuum* in the leaves, the more slender, ridged scape, the larger involucre and the more distinct midveins of the

perianth segments. In *A. cernuum* the leaves are almost flat and more or less keeled. In *A. recurvatum* there is no keel and the channel is rounded as well as the back. The leaves of *A. cernuum* are also much wider, the flowers are generally much paler in that species and the perianth segments have an indistinct midvein. *A. recurvatum* is common in the Rocky Mountains and British Columbia.

HABENARIA MACROPHYLLA, Goldie.

This species is much rarer than *H. orbiculata* with which in recent years it has been confounded. *H. orbiculata* ranges from the Atlantic to the Pacific and north to Alaska. *H. macrophylla* has not been found west of Wisconsin. Our specimens are from Newfoundland, 13,771, (*B. L. Robinson* & *H. Schrenk*), and Muskoka, Ont., 27,223. (*W. Spreadborough*.) Many specimens of both species have been examined by Mr. Oakes Ames; the spur of *H. orbiculata* was found to be from 16 to 27 mm. long, while that of *H. macrophylla* ranged from 32 to 43 mm. in length. The flowers of the latter species are also much larger.

SALIX CHLOROLEPIS, Fernald, Rhodora, VII : 186.

Meadows at the headwaters of Ruisseau au Diable, Mt. Albert, Gaspé, Que. (*Collins* and *Fernald*.)

SALIX MACROSTACHYA, Nutt.

Along the Kettle River at Cascade, B.C. In flower, June 26th, 1902, No. 68,128. (*J. M. Macoun*). New to Canada.

SALIX SERISSIMA, (Bailey) Fernald, Rhodora, VI : 6.

S. lucida, Cat. Can. Pl. II : 450 in part.

Mr. Fernald gives no other Canadian localities for this species than "north shore of Lake Superior." Our herbarium specimens are from the mouth of Albany River, James Bay, Hudson Bay, No. 62,628. (*W. Spreadborough*) ; Salt Lake, Anticosti, Que., No. 24,584. (*John Macoun*) ; Galt, Ont., No. 63,120. (*W. Herriot*) ; Nipigon, Lake Superior, Ont., No. 24,583. (*John Macoun*) ; Severn River, Keewatin, No. 2,028, Beren's River, Man., No. 24,618, and Muskeg Island, Lake

Winnipeg, Man., No. 24,619. (*Jas. M. Macoun*); Grattan Creek west of Battle River, Alta.; Edmonton, Alta., No. 24,621, and Bow River at Morley, Alta., No. 24,620. (*John Macoun*).

SALIX LUCIDA, Mahl., var. *INTONSA*, Fernald, *Rhodora*, VI : II.

Recorded by Mr. Fernald from St. John River and tributaries, Maine, Quebec, and New Brunswick. Our specimens are from Montmorency Falls, Que., Nos. 68,782 and 68,783. (*John Macoun*.)

SALIX LUCIDA, Muhl., var. *ANGUSTIFOLIA*, Anderson.

Grand Lake, N.B., No. 24,586. (*John Brittain*); bank of Exploit River, Newfoundland, No. 13,674. (*Robinson & Schenk*.)

HUMULUS JAPONICUS, Sieb. & Zucc.

In waste places at Wakefield, Que., 1903. (*John Macoun*.)
Naturalized.

COMANDRA RICHARDSIANA, Fernald, *Rhodora*, VII : 32.

C. umbellata, Nutt., in part.

So far as shown by our specimens *C. umbellata* does not occur in Canada, everything so called being the recently described *C. Richardsiana*.

POLYGONUM NUTTALLII, Small.

P. intermedium, Macoun, Cat. Can. Plants, II : 352.

Grassy banks, Middle Creek, Chilliwack River. B.C., No. 54,740. (*J. M. Macoun*.) Not recorded from mainland of B.C.

POLYGONUM PUNCTATUM, Ell., var. *LEPTOSTACHYON*. (Meisn.) Small.

Low ground near Sumas Lake, B.C. No. 54,752. (*J. M. Macoun*) New to Canada. Abundant, but perhaps introduced.

POLYGONUM BISTORTOIDES, Pursh.

A common species at an altitude of between 5,000 and 6,000 feet on mountains in the Chilliwack and Skagit valleys. B.C., near the International Boundary. (*J.M. Macoun*.)

CHENOPODIUM BOSCIANUM, Moq.

Sandy thickets, Pelee Point, Lake Erie. No. 54,724.
(*John Macoun.*) New to Canada.

AQUILEGIA COLUMBIANA, Rydb., Bull. Torr. Bot. Club, xxix : 145.

This species is somewhat intermediate between *A. formosa* and *A. truncata* and has been mistaken for both. It has the habit, spur and sepals of the former and the short truncate lamina of the latter. From Banff to Alaska.

DELPHINIUM BROWNII, Rydb., Bull. Torr. Bot. Club, xxix : 148.

This is most nearly related to *D. glaucum* but differs in the puberulent leaves with narrow segments, the lax raceme with more erect pedicels and the darker flowers. Described from specimens collected at Banff in 1893 by Addison Brown. A common plant in that region.

RANUNCULUS ALLENI, Robinson, Rhodora, vii : 220.

R. affinis var. *leiocarpus*, Cat. Can. Pl. i : 18.

First collected by Mr. J. A. Allen on Mt. Albert, Gaspé, Que., in 1881, the next year by John Macoun at the same place, No. 1,015, and in 1883 on Table Top Mountain not far from Mt. Albert by James Porter, No. 68,678. Other localities cited by Dr. Robinson are: Okkak, Labrador, and Rama, Labrador.

RANUNCULUS GLABERRIMUS, Hook.

Penttonton, Lake Okanagan, B.C., April 12th, 1903. No. 59,519. (*W. Spreadborough.*) Not recorded from that region.

RANUNCULUS YUKONENSIS, Britt.

Near Peace River Landing, Atha.. No. 59,521. June 8th, 1903. (*J. M. Macoun.*) Recorded before only from the Yukon district.

CAULOPHYLLUM THALICTROIDES, Mx.

In woods along the Assiniboine River near Portage La Prairie, Man. In flower, May 31st, 1906. (*W. Herriot.*) Western limit in Canada

LEPIDIUM DRABA, L.

Waste places at Trail, Columbia River, B.C. No. 67,986.
(*J. M. Macoun.*) Not recorded from B.C.

LEPIDIUM SPINOSUM, L.

Near the "ball grounds," Toronto, Ont., 1904. (*W. Scott*) New to Canada. A native of the Orient and of Greece.

SISYMBRIUM OFFICINALE, Scop.

Rare in Canada, our specimens being from Niagara, Ont., No. 33,859. (*John Macoun*); Wingham, Ont., No. 2,110 (*J. A. Morton*), and Esquimaux, Vancouver Island, B.C., No. 2,109. (*John Macoun*). The inflorescence and pods, even at full maturity, subtomentulose.

SISYMBRIUM OFFICINALE, Scop. var. LEOCARPUM, DC.

This variety as pointed out by Dr. Robinson (*Rhodora*, vol. VII: 102) is the common form in North America being represented in our herbarium by specimens from Baddeck, Cape Breton Island, N.S., No. 18,039, (*John Macoun*); Ottawa, Ont., No. 2,113, (*John Macoun*); Wakefield, Que., No. 59,813. (*John Macoun*); Belleville, Ont., No. 2,114. (*John Macoun*); Nelson, Kootenay Lake, B.C., No. 2,111, (*John Macoun*); Sicamous, B.C., No. 2,112, (*John Macoun*); Nanaimo, Vancouver Island, B.C., No. 2,115, (*John Macoun*); Chilliwack River, B.C., No. 33,860. (*J. M. Macoun*). The inflorescence nearly smooth; the pods entirely glabrous or with a few scattered hairs.

RADICULA CLAVATA, (Rydb.) Bull Torr. Bot. Club, xxix: 235.
Nasturtium palustre, DC. var., Macoun, Cat. Can. Plants,
II: 300 in part.

Port Henry and Agassiz, B.C., 1889. (*John Macoun.*)

DENTARIA TENELLA, Push.

Harrison, B.C., 1902 No. 63,504. (*W. Spreadborough.*)
Eastern limit in Canada.

DRABA MCCALLÆ, Bull. Torr. Bot. Club, XXIX: 241.

Moose Mountain, Elbow River, Alta., No. 18,139, 1897 ; Summit of Pipestone Pass, Rocky Mt. Park, No. 64,442, 1904. (*John Macoun.*) Described from specimens collected by Mr. W. C. McCalla at Banff in 1899. This species belongs to the *D. incana* group but differs from that species in the elongated peduncle, long pedicels, short pubescent pod and large petals.

ARABIS COLLINSII, Fernald, Rhodora, VII: 32.

"Quickly distinguished from *A. Holboellii* by the loose hispidulous pubescence of the stem and pedicels, the smaller flowers and the very slender acutish pods." Collected on dry limestone conglomerate ledges, headland in the harbour of Bic, Rimouski Co, Que, July 18, 1904. (*J. F. Collins & M. L. Fernald.*)

DROSERA ROTUNDIFOLIA, L. var. **COMOSA**, Fernald, Rhodora, VII: 9.

A dwarf variety of the common sundew with crimson or roseate instead of white flowers; the petals are sometimes foliaceous and the carpels are developed in maturity into green, glandular broadly obovate or oblate petioled leaves. Collected in abundance near the mouth of Grand River, Gaspé Co., Quebec, in 1904 by Messrs. J. F. Collins, M. L. Fernald and A. A. Pease. An examination of a large series of specimens of *D. rotundifolia* in our herbarium shows nothing approaching this variety.

SAXIFRAGA HIERACIFOLIA, Waladt and Kit.

Pond's Inlet, Lat. 72° 45', Cockburn Island. Aug 20th, 1904. (*Dr L. E. Borden.*)

THE SPRING MIGRATION OF BIRDS AT OTTAWA OF THE YEAR 1906, COMPARED WITH THAT OF OTHER SEASONS

By C. W. G. EIRIG.

The winter of 1905-06 was in several respects a remarkable one. There was less snow and fewer days of severe cold weather than for many preceding winters. It was more open and mild, than for many past seasons. All this was somewhat changed at a time when one expects to see the end of winter come in earnest, in March. There was more snow and cold then, than apparently had been in the previous winter months combined, or as someone told the writer : Winter only commenced in March. That such unusual weather conditions would naturally tend to modify biological conditions in the plant and animal kingdoms, was to be expected. All nature-lovers, the botanists, entomologists, etc., therefore eagerly looked forward into the now sadly retarded spring, to see how this would be made manifest in their several lines of observation. In no class of biota, however, would the effect of such unusual climatic conditions be more noticeable than in the birds, as that fascinating, mysterious natural phenomenon of their migration is in many species greatly dependent on the weather. The ornithologist therefore was especially on the alert this spring to see how the coming of his feathered friends had been affected by the queer ending of the winter and beginning of the vernal season.

One somewhat unexplainable fact was noted by them already in winter. One would think, that in such a mild winter as the last was for its greater part, there would be more of our usual permanent residents amongst birds, or of the erratic Canadian winter birds seen, or at least as many, as in the more severe winters. But the reverse was true. While in the severe winter of 1903-4 pine grosbeaks were plentiful here all winter, and 1904-5 Canada jays and sharpshinned hawks, together with, as the appended list shows, occasional downy woodpeckers, pine siskins, redpolls, brown-breasted nuthatches, and the everpresent jolly little chickadee, these and similar birds were last winter conspicuous by their absence in the silent wintry woods.

Quite a number of the birds included in this list are irrelevant to the scope of this article, but are included for completeness' sake, to show about when they may be looked for and what birds come this way at all. Such birds that do not show anything in this connection are e. g. the redpoll, pine siskin, brown-breasted nuthatch, crow, blue jay, etc., because they may be considered permanent residents, or because they do not follow any apparent rules in their coming and going, their presence or absence. Other such erratic birds are the pine grosbeak, Canada jay, evening grosbeak, arctic-three-toed woodpecker, etc., which are here omitted. Others, such as the ducks, rails, herons, hawks are not quoted to prove much in this connection, because they are not easily observed or are rare, so that they may be for days or even weeks in their chosen haunts, before the ornithologist, who can not always go to such difficult places, may see them.

The effect that we would expect the severe outgoing of the winter and incoming of the spring to have upon the migration of birds, is that the birds would be retarded to a greater or less extent. And this is what the following list shows. The first commonly observed migrant in our parts is the prairie horned lark. That comes at the end of February. Now, because last winter up to that time was unusually mild, the coming of this little bird was earlier than usual. Feb 20, or at least no later. Then came the snowy and cold March, the effect of which can be seen by the lateness of arrival of such birds as the purple finch, robin, bronzed grackle, song sparrows, red-winged black bird, bluebird, and junco, which here are the first of the real and regular migrants. These were this year kept back for a time of from several days to two weeks. Then came warm, May-like weather in April. which made the date of arrival of the species falling into this month again normal, or may have even accelerated it with some, whereas the somewhat raw weather of the first half of May again had the contrary effect. It may be said, that a single, dejected-looking robin was this year seen as early as March 9th in a garden along the Rideau, and again on the 17th, but the real robin migration did not begin before the date given.

I must also state that much material in the line of dates has been furnished to me by other members of the Ornithological sec

tion, by the Messrs. G. and E. White, Kingston and Gallup, and by Mrs. R. D. Brown and Miss Lees of Ottawa East.

	1906.	1905.	1904.
Sharp-shinned Hawk .....	.....	Feb. 18	Jan. 3
Crow	Jan. 28	Feb. 18	Mar. 3
Prairie Horned Lark	Feb. 20	Feb. 28	Mar. 7
Brown-breasted Nuthatch	Mar. 10	Mar. 1	Jan. 14
Great Gray Owl	Feb. 1	.....	.....
Cedar Bird	Mar. 17	Mar. 28	May 26
Purple Finch	Mar. 29	Mar. 1	May 4
Golden-eye (<i>Clangula Am.</i>)	Mar. 29	Apr. 17	Jan. 4
Robin	Mar. 31	Mar. 19	Mar. 24
Bronzed Grackle	April 2	Mar. 27	Mar. 28
Song Sparrow	April 2	Mar. 18	Mar. 24
Red-winged Blackbird	April 2	Mar. 24	Mar. 25
Bluebird	April 3	Mar. 24	Mar. 24
American Herring Gull	April 3	April 10	Mar. 24
Red-shouldered Hawk	April 1	April 24	April 25
Canada Goose	April 4	April 4	.....
White-breasted Nuthatch	April 4	Feb. 28	Jan. 30
Meadowlark	April 5	April 3	April 5
Blue Heron (<i>vulgo</i> Crane)	April 5	April 27	April 18
Junco	April 6	Mar. 23	Mar. 26
Hooded Merganser	April 7	April 17	April 14
Sparrow Hawk	April 7	April 18	April 21
Cowbird	April 8	Mar. 29	Mar. 30
Downy Woodpecker	April 8	April 11	Jan. 14
Tree Swallow	April 8	April 3	April 8
Black Duck	April 7	April 13	.....
Wood Duck	April 7	.....	.....
Phoebe	April 9	April 8	Mar. 28
Tree Sparrow	April 9	Mar. 24	April 15
Red-tailed Hawk	April 9	April 25	April 15
Marsh Hawk	April 12	April 1	April 17
Golden-crowned Kinglet	April 14	April 8	April 14
Hermit Thrush	April 14	April 10	April 14
Brown Creeper	April 15	Mar. 30	Mar. 12
Vesper Sparrow	April 15	April 12	April 15
Savanna Sparrow	April 15	April 11	April 18
Yellow-bellied Sapsucker	April 15	April 10	April 9
Chipping Sparrow	April 15	April 12	April 23
Flicker (<i>Colaptes auratus</i>)	April 16	April 10	April 18
Migrant Shrike	April 16	Mar. 30	April 6
Killdeer	April 16	Mar. 28	April 8
Kingfisher	April 16	April 8	May 5

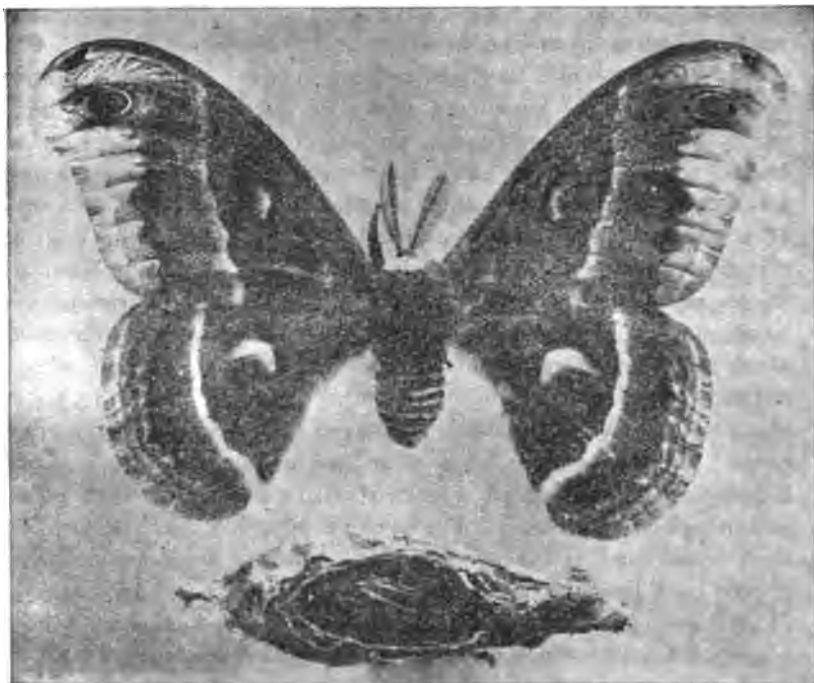
	1906.	1905.	1904.
Bittern	April 16	May 24	May 3
Blue Jay	April 16	Feb. 18	Mar. 17
Goldfinch	April 17	Mar. 13	May 26
White-throated Sparrow	April 15	April 23	May 7
Osprey, Fish Hawk	April 18	April 17	.....
Winter Wren	April 18	April 27	.....
Swamp Sparrow	April 18	May 8	April 26
Wilson's Snipe	April 20	May 4	April 14
Pied-billed Grebe	April 20	.....	April 29
Barn Swallow	April 21	April 25	April 26
Hairy Woodpecker.	April 21	May 5	May 17
Loon	April 21	.....	.....
Purple Martin	April 22	April 23	April 16
Chimney Swift.	April 30	May 2	May 7
Ruby-crowned Kinglet	May 1	April 27	.....
Brown Thrasher	May 1	May 6	.....
Whippoorwill	May 1	May 13	May 5
House Wren	May 2	April 28	May 5
Spotted Sandpiper	May 2	May 4	May 5
Myrtle Warbler	May 2	May 1	May 4
Black-and-white Warbler	May 4	April 28	May 4
Fox Sparrow	May 4	April 27	.....
Yellow Warbler	May 4	May 1	May 7
Bobolink	May 5	May 2	May 7
Connecticut Warbler	May 5	.....	.....
Cooper's Hawk	May 6	.....	Feb. 16
Warbling Vireo	May 6	May 10	May 12
Veery	May 6	May 6	May 7
Black-throated Green Warbler	May 7	May 1	May 10
Parula Warbler	May 7	May 10	May 7
Nashville Warbler	May 7	May 7	May 10
Pine Warbler	May 7	May 6	.....
Black-throated Blue Warbler	May 7	May 10	May 16
Kingbird	May 7	May 5	May 7
Rusty Grackle	May 7	April 10	April 18
Sora	May 8	.....	May 26
Blackburnian Warbler	May 10	May 1	May 7
Cliff Swallow	May 9	May 17	.....
Waterthrush	May 11	May 8	May 26
Great Crested Flycatcher	May 11	May 12	May 7
Yellow-throated Vireo	May 11	.....	.....
Least Flycatcher, Chebec	May 11	May 5	May 6
Woodcock	May 11	.....	May 26
Maryland Yellowthroat	May 11	May 4	May 10

	1906.	1905.	1904.
Cape May Warbler	May 12	May 22	.....
Rose-breasted Grosbeak.....	May 13	May 11	.....
Olive-backed Thrush	May 13	May 16	.....
Chestnut-sided Warbler.	May 13	May 7	May 10
Ovenbird	May 13	May 6	May 10
Baltimore Oriole.	May 13	May 6	May 8
Bank Swallow	May 13	May 18	.....
Yellow Palm Warbler	May 14	May 1	.....
Grey-cheeked Thrush.....	.....	May 14	.....
Red-eyed Vireo	May 15	May 6	May 12
Blue-headed Vireo.....	May 15	May 7	May 7
Catbird.....	May 15	May 6	May 12
Redstart	May 15	May 5	May 5
Hummingbird	May 15	May 11	.....
Bay-breasted Warbler.....	May 16	May 19	May 23
Magnolia Warbler	May 16	May 10	May 10
White-crowned Sparrow.....	May 16	May 6	May 10
Nighthawk.....	May 16	May 14	May 11
Tennessee Warbler.	May 17	May 24	May 23
Scarlet Tanager.....	May 17	May 14	May 21
Wood Pewee.....	May 17	May 4	May 17
Solitary Sandpiper.....	May 18	.....	May 12
Mourning Warbler.....	May 19	May 12	May 23
Canadian Warbler	May 19	May 12	May 26
Yellow-bellied Flycatcher.	May 19	May 23	.....
Alder Flycatcher.	May 19.	May 24	.....
Least Sandpiper.....	May 21	.....	.....
Blackpoll Warbler.....	May 21	May 17	May 23
Wilson's Warbler	May 21	May 19	May 26
Red-headed Woodpecker.	May 26	.....	April 26
Olive-sided Flycatcher.....	May 28	May 24	May 26
Broad-winged Hawk.	May 28	April 25	.....
Philadelphia Vireo	May 30	May 17	.....
Indigo Bird.....	.....	May 24	May 26

NATURE STUDY No. XXXVII.

THE CECROPIA EMPEROR MOTH (*Samia cecropia*, LINN.)

BY ARTHUR GIBSON, Assistant Entomologist, Experimental Farm, Ottawa.



Cecropia Emperor Moth and Cocoon, reduced in size.

Among our native insects, probably none attract greater attention from those who have made no study whatever of entomology than the large Emperor Moths, the caterpillars of all of which are true silk-worms. These moths are the largest we have in North America, and, being of such a size and also of striking beauty, they always command admiration. Unlike many other moths, their mouth parts are aborted and consequently they are unable to eat. In their caterpillar state, however, they are very voracious eaters and during that period of their existence will consume many times their weight of food. When full grown these

large, heavy caterpillars are found hanging on the under-side of leaves and twigs, but on account of their green colour they are rather difficult to detect.

The *Cecropia* Emperor Moth, the subject of this article, is the largest and one of the most beautiful insects found in North America. When the wings have been spread this magnificent moth measures from five to seven inches across. The figure* given herewith, which has been reduced in size, shows the moth which is doubtless known to many of our readers. The four wings are of a rich brown and all are crossed with conspicuous bands. The band on each front wing is dull red, more or less edged within with white, while that on each hind wing is a brighter red, almost crimson in some specimens, edged distinctly inside with white. In the figure, which is from a photograph, only the white portions, of course, of these transverse bands show. The front wings are dusted with gray towards and along the upper margin, and through that portion of each wing beyond the transverse band. Near the centre of the wing, and also towards the base, reddish patches are present in most specimens. All the wings have, near the middle, a large nearly kidney-shaped mark which is white shaded more or less with red, and margined with black. The eye-like spot towards the tip of each front wing is black with a bluish white crescent, and the curved band near the base is white and black. The outer edges of all the wings are paler, and there is present on each front wing a wavy black line which on each hind wing is replaced by a double band of the same colour. The upper side of the body is dull red, as are also the legs. Just behind the head there is a wide white band. The abdomen in most specimens is reddish-brown, the cross bands of white being very conspicuous. Both sexes are similar in appearance, the female only differing from the male in the larger abdomen and much smaller antennæ, or feelers.

It is often difficult to understand an author's reason for selecting the name by which a species is to be known, and much discussion among naturalists has taken place regarding Linnæus's application of the name of the ancient city of Athens, to this moth. The late Dr. Asa Fitch in his third report on the Noxious and

*From Fourth Annual Report of the Entomologist of the State Experiment Station of the University of Minnesota, kindly loaned by Prof F. L. Washburn.

other Insects of the State of New York, gives the following explanation :—" The idea which was present in the mind of Linnæus, when he named this splendid moth, we think is sufficiently evident. The Athenians were the most polished and refined people of antiquity. The moths are the most delicate and elegant of insects ; they are the Athenians of their race. Cecrops was the founder, the head of the Athenian people. When names of men were bestowed upon cities, ships, or other objects regarded as being of a feminine gender, classical usage changed these names to the feminine form. The moths (*Phalæna*) being feminine, and the name of Cecrops being more euphonious in this form, probably induced Linnæus to change it in the manner he did. The name thus implies this to be the leader, the head of the most elegant tribe of insects, or in other words, the first of all the insect kind. What name more appropriate can be invented for this most sumptuous moth ? "

The cocoon of this insect, shown beneath the moth in the above figure, is the largest and best known of the cocoons found in this country. It is about three inches in length, an inch or more in width at its widest part, and tapers to both ends. Some specimens, of course, are larger than this ; we have examples that measure four inches long and two inches wide at the centre. In colour the cocoon is a rusty gray, or brownish. If one is cut into with a sharp knife, or a pair of scissors, an inner, oval cocoon will be found. Within this is a large, black pupa, to one end of which is attached the head of the caterpillar and the cast skin of its body. This inner cocoon will be noticed to be much more closely woven. It is interesting to watch the caterpillar making its cocoon. From the time it begins to spin it never ceases until its work is completed, and the whole cocoon is spun in one continuous thread. In the case of the American Silkworm, *Telea polyphemus*, L., it has been stated by Trouvelot that this caterpillar in making its cocoon, will have moved its head to and fro, in order to distribute the silk, 254,000 times, the length of time taken to complete this operation being from three to five days.

During the past season the caterpillars of the *Cecropia* Emperor Moth have been more than usually abundant in eastern Canada. It is altogether likely, therefore, that many cocoons will be found on apple, maple, plum, and other trees during the coming winter. The moths emerge in the latter end of May and early in June, and if any of our members would like to experience the pleasure of watching one of these large Emperor Moths escaping from its cocoon, it is only necessary to collect one or two of the cocoons, and keep them in an

out-building throughout the winter, bringing them into the house next May. The cocoons, of course, should be put into a box with rough sides, so that when the moths emerge they can hold on while their wings are expanding. It will be noticed that one end of the cocoon is spun very loosely, and it is from this end that the moth emerges. The head first appears, then the front pair of legs, and soon the other pairs of legs, the heavy body, and the undeveloped wings. As soon as it has attached itself to a nearby object, these latter soon expand and in less than an hour the two pairs of wings attain their full size.

The caterpillars of the *Cecropia* Emperor Moth hatch from whitish eggs laid in June. They moult, or cast their skins, four times before reaching full growth. At first they are black, changing in the next stage to a deep orange, and in the third stage to yellowish green. In the next and also in the last stage the colour is more of a bluish green. In all the stages the body bears tubercles the colours of which are different after each moult. When full grown the *Cecropia* caterpillar is from three to four inches long, and is about as thick as a man's thumb. On segments 2 and 3, the tubercles are large and of a bright coral red colour; the other tubercles on the back are smaller and yellow, excepting those on the first and last segments which are blue, as are also the smaller tubercles along the sides. These caterpillars although so beautiful and striking in appearance, from their great size and conspicuously coloured tubercles, are considered very disgusting creatures by many, and this of course is but natural. It would not be human nature if everyone had the same likes and dislikes—it takes all kinds of people to make a world.

The caterpillar of this moth is a very general feeder and over fifty different plants have been recorded upon which it has been found feeding. In Canada the favourite food plants are apple, maple, birch, cherry, plum and willow. Although this caterpillar has a very voracious appetite, it is seldom that it really does very much harm, as it is unusual to find more than two or three larvæ on the same tree, and when their presence is noticed they can easily be removed by hand.

This grand insect occurs in Canada in Ontario, Quebec and the Maritime Provinces, and specimens may every year be collected or seen flying around electric lights. In certain seasons, however, their numbers are greatly reduced by natural parasites, the most important of which are the Long-tailed Ophion, *Ophion macrurum*, L., which forms a single close cocoon inside that of its host, and *Cryptus extrematis*, Cresson, of which several occur inside a single caterpillar, and when this latter has spun its winter resting place they emerge and entirely fill the space with their own cocoons.

the Libr. Dup.

23

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CONTENTS.

	Page
1. Animal Coloration, by Professor Edward E. Prince ..	153
2. Botanical Note	161
3. Contributions to Canadian Botany, by James M. Macoun....	162
4. Entomological Society of Ontario	171
5. <i>Limnæa megasoma</i>	172
6. Note, by C. W. G. Eifrig.. ..	172
7. Nature Study—No. 38—by James Fletcher	173

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THE OTTAWA NATURALIST.

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OTTAWA, MARCH, 1907.

No. 12

SOME CURIOUS FACTS ABOUT FISHES.

(Based on an address delivered before the "Unity Club.")

By ANDREW HALKETT.

The subject of this article is : certain strange facts concerning the habits and structure of fishes. A goodly sized volume might be devoted to this subject to do it justice ; therefore a few singular facts only are given here, under distinctive headings.

FISHES THAT CAN LIVE FOR A PROLONGED TIME OUT OF WATER.

The November, 1901, issue of the OTTAWA NATURALIST contained a short article of mine, entitled : "An African Dipnoid Fish" treating of a group of fishes distinguished from all others by "the double character of the respiratory organisation : these remarkable fishes breathing not only under water by gills, but at times when the waters dry up, atmospheric air by rudimentary lungs" ; and a succinct account of this dipnoid group is contained in that article.

But the lung-breathers are not the only kind of fishes which can live for a longer or shorter time out of water. There are others whose gills are provided with accessory organs for retaining water, so that those fishes are supplied with oxygen during their sojourn on land. A well-known instance of this is the Climbing Perch of India, a fish which leaves the water and walks by the aid of its spines over land. It even climbs trees ; a fact alluded to by Herbert Spencer in his "Principles of Biology," and Daldorf in a memoir communicated long ago to the Linnean

Society mentions having taken a climbing perch in the act of ascending a palm-tree which grew near a pond. "The fish had reached a height of five feet above the water, and was going still higher."* Furthermore, Drs. Parker and Haswell in their "Text-Book of Zoology" state that the climbing perch "has become so thoroughly a land animal that it is drowned if immersed in water."

There are also certain gobies of the Indo-Pacific which move about over the ground at low tide in search of their food, and take rapid leaps to escape danger. It has been asserted of these also that they would drown if forced for an indefinite time to remain under water. One of those gobies I have myself seen resting on a moist object in its aquarium.

Whilst engaged in some Fisheries matters, at the Trent River, Ontario, a few years ago I had some fishes boxed up and expressed to Ottawa. On opening the box on my arrival I found some of the mud-pouts still alive and when replaced in water they were soon themselves again; and whilst turning over moist stones along the shore at the west side of Vancouver Island I was surprised to find numerous little frisky, elongated, and compressed fishes which were there awaiting the return of the tide.

FISHES WITH BOTH EYES ON THE SAME SIDE OF THE HEAD.

There are instances of distortion in nature. I mean by this term not some individual freak, but a distortion brought about by a modification of structure permanently affecting a whole group of creatures. The flat-fishes, which are very compressed, are an instance of this. When the newly hatched halibut, or the plaice, or the flounder, has left the egg, it is essentially just like any other fish, with an eye on either side of the head. Very soon, however, the eye of one side, in certain kinds the right in others the left, moves around to meet its fellow, thus leaving one side of the fish eyeless and blind. The jaws also undergo distortion, and the eyeless side remains whitish like the under parts of other fishes, whilst the eyed side becomes covered with pigment coloring substance. The fish then lies on the blind side, which serves the same purpose as the under part of fishes in general.

*Dr. Günther: 'An Introduction to the Study of Fishes,' p. 516.

ELECTRIC FISHES.

There are three kinds of fishes, unrelated to each other, which possess electric functions : that is, they are capable of giving electric shocks. They are the Torpedoes, or Electric Rays ; the Electric Eel ; and the Sheath-fishes, or Electric Cat-fishes. There are others, the names of which need not be mentioned, which possess elementary or pseudo-electric organs. The electric muscular substance is differently adjusted in the three kinds enumerated. In the Torpedoes the batteries lie on either side of the head ; in the Electric Eel they are longitudinal bodies in two pairs, immediately below the skin ; and in the Sheath-fishes they extend all over the body, being thickest on the abdomen.

I had once an opportunity to test the powers to give electric shocks which two of these three kinds of fishes possess. Being invited by the keeper of the aquarium of the Zoological Gardens in London to receive a shock from an Electric Eel, I placed my hands upon the fish and received it, but it was slight, a circumstance probably due to the fact that the eel was not at home in its changed environment. Shortly afterwards Dr. Forbes, who kindly escorted me through the aquarium of the Liverpool Public Museum asked if I would like a shock from an electric cat-fish. I remembered the slight shock which the eel had given, and therefore readily placed my hands on the side of the fish, but the shock it gave was so violent that I would not again care to repeat the experiment.

FISHES WHICH TAKE CARE OF THEIR PROGENY.

The vast majority of fishes, of which there are some 13,000 known species, take no care whatsoever of their progeny. The eggs are deposited, and then immediately fecundated, and the parents never see their young, unless they should afterwards encounter them, as they might other fishes, and perhaps devour them. A comparatively few, however, do take care of their young. In some such as the black bass and certain cat-fishes both parents do. In a few only the female does. The females of the cat-fishes of the genus *Aspredo*, of Guyana, press the eggs into a spongy

integument of the skin by lying over them, and then carry them about until hatched.

But in most fishes which take care of their young the filial duties, strange to say, devolve upon the males. A very singular instance of this is some of the Pipe-fishes, upon the males of which devolves the duty of caring for the young. On the ventral side of the male is a long groove : the opening of a pouch which is suspended from the fish, and in which the eggs and hatched-out young ones are carried about ; whereas the female does not possess any such pouch, and after depositing the eggs she takes no further care of them.

Again, the male Stickleback constructs a little nest of weeds or other material, which has an entrance at one side. According to Costa, who made a close study of the habits of sticklebacks, and upon whose observations these remarks are in measure based, he then goes in search of a female, whom he conducts to the nest where she lays some eggs. Then she makes her exit by the opposite side of the nest, so that it now has two openings. Next day or so he goes again in search of a female finding perhaps, the same one, or perhaps another, who a second time is escorted to the nest ; and each day this is repeated until the nest contains a goodly number of eggs. Then he assiduously guards them from intruders, including the very female sticklebacks. Nor do his duties cease until the eggs are hatched and the young are able to look out for themselves.

The males of the cat-fishes of the genus *Arius* have another way of taking care of the eggs. The eggs of these fishes are proportionately very large, so that the females lay only a comparatively few. These the male of some, if not all, of the species, carries about in his mouth, or rather in his capacious pharynx ; until hatched.

HOW THE KNOTTY QUESTION AS TO THE PROPAGATION OF THE EEL WAS SOLVED.

Since Aristotle's time the mode of propagation of the eel has been one of the most knotty questions which has engaged the attention of ichthyologists. Aristotle himself gave the subject con

siderable attention, but whilst in many respects the descriptions of that great observer in connection with animals in general would be worthy of a modern zoologist, the nonsense he wrote in endeavouring to solve the intricacies as to the propagation of the eel is hardly worthy of notice ; yet his opinion swayed the minds of naturalists for ages.

As late as 1880, or twenty-six years ago, Jacoby wrote as follows in treating of the eel :—

To a person not acquainted with the circumstances of the case it must seem astonishing, and it is certainly somewhat humiliating to men of science, that a fish which is commoner in many parts of the world than any other fish, the herring perhaps excepted, which is daily seen in the market and on the table, has been able, in spite of the powerful aid of modern science, to shroud the manner of its propagation, its birth, and its death in darkness, which even to the present day has not been completely dispelled.*

Since then more light has come to the students of fishes as to its propagation, and experts have sought to solve the problem, by approaching it along several paths.

More than two hundred years ago a group of ribbon-shaped fish-like creatures were discovered, all the known kinds of which are marine, and it has been proved, within the last two decades, that these are the larval forms, or what we may call the juvenile forms, of different species of eels.

The discovery of ripe eel eggs is due to the researches of Raffaele and Grassi, and dates no further back than 1888, or 18 years ago.

Since 1900, or six years ago, Carl H Eigenmann, of Bloomington, Indiana, following in the paths opened out of these, and other investigators, has further pursued the subject, and in a pamphlet entitled : "The solution of the Eel question" sums up his conclusions as follows :—

We now know, (1) that eels, both male and female, migrate to the ocean during October to January ; (2) that these eels probably deposit the eggs that are found on the surface during the following August to January ; (3) that the eels do not ripen in shallow water, but the female, according to Grassi, at a depth of five hundred meters ; (4, that the eggs of the eels float, according to Grassi, at a great depth ; according to Raffaele and Eigenmann at the sur-

*Carl H. Eigenmann : 'The Solution of the Eel Question.' Re-printed from 'Transactions of the American Microscopical Society,' Aug., 1901, p. 5.

face; (5) the development of some eels for the first fifteen days and that the resulting creature is different both from the adult eel into which it will develop, and from the larva of the eel; (6) the *Leptocephalus* of the eel and the process of its metamorphosis through a *Hemichthys* stage into the young eel as it is found entering the streams; (7) [the young eels enter the streams during spring about two years after their parents have entered the sea. †

Whether they ever do, or do not breed in fresh water is a question still unsolved: and in this connection Eigenmann says:—

The question whether or not the eel ever breeds in fresh water has been answered in the affirmative by several observers. There is nothing that would indicate the adherent impossibility of eels becoming land-locked and breeding in fresh water. The evidence is, however, so far inconclusive. No one has yet taken eel eggs or larval eels, or younger eels than those that ordinarily ascend streams from the ocean in any fresh water. The statement that they must breed, because we know of no other way in which the supply of eels is being maintained in land-locked basins is not conclusive evidence that they do breed in these basins. ‡

It would seem, at first thought, incredible that eels from far inland lakes should ever make their way to the sea, (and in the case of the young, *vice versa*, from the sea to the lakes), but their instincts lead them that way at the approach of the spawning time; and doubtless thousands perish in the attempt; but we must bear in mind their serpentine form, their wriggling movements, and the fact that they can live for a considerable time out of water, so that they are enabled to make their way through obstacles utterly insurmountable to other fishes.

They go to the sea when about four years old and are said never to return; the young ones taking their places by ascending the streams in incalculable millions, a comparatively few ever reaching the upland lakes and rivers, but the overcomers make use of swollen tributaries, flood-gates, and even moist places between shut off waters, in getting to the limits of their extensive geographical range.

BRILLIANT HUES OF FISHES OF THE CORAL REEFS.

Naturalists are well acquainted with a phenomenon known as protective coloration in animals. In other words various animals

† Carl H. Eigenmann: I bid: p. 16.

‡ Carl H. Eigenmann: Ibid: p. 17.

so resemble their surroundings as to be disguised either from their enemies or from their prey. According to conditions the hue may be sombre or brilliant. A partridge for instance resembles the dried leaves among which she has her nest, and green parrots resemble the foliage of the trees among which they dwell. Among fishes there are instances both of sombre and brilliant coloration, whereby, in either case, they are concealed. Instances of the latter are certain fishes of the coral reefs. Were these of dull colors, they would readily be seen whilst they moved about among the beautiful flower-like zoophytes ; therefore they are singularly ornamented with colors of surpassing beauty. Incidentally were one asked the question whether a bright red or a jet black object would most readily attract attention, the answer would naturally be the bright red of course. But that depends on conditions. If a scarlet cloth were hung upon the wall, and an object similarly colored placed against it, it would not readily catch the eye ; but if a jet black object were placed against the red cloth, it would readily be seen. For the same reason, evidently, such beautiful fishes as the tropical chaetodons, and other forms which abound among the coral mounds, are embellished in gorgeous reds, blues, yellows, or greens : colors ordinarily conspicuous, but which offer concealment, more or less, to those fishes amid their natural environments.

THE ANGLER OR SO CALLED FISHING FROG.

A case the opposite to the above is the so called Fishing Frog or Angler. This fish is not readily detected because it is of the sombre hue of its surroundings, and has moreover the power to change its color according to the character of the surroundings. The Angler lurks at the bottom of its retreat with its great gaping mouth ready to devour its prey. A long filament issues from the back of its head, which the angler waves about like a fishing rod. This filament terminates in a bait like lapper, and some unwary little fish which does not see the angler comes to nibble at it, and is at once engulfed in the great gape of this wily creature.

THE DISAPPEARANCE OF THE PASSENGER PIGEON.

JAMES H. FLEMING, Toronto, Ont.

The disappearance of the passenger pigeon in Ontario dates back at least forty years, though as late as 1870 some of the old roosts were still frequented, but the incredible flocks, of which so much has been said, had gone long before that date, and by 1880 the pigeon was practically exterminated, not only in Ontario, but over the greater part of its old range. There are, however, occasional records of birds taken, for some years later, an immature bird taken Sept. 9, 1887, in Chester county, Pennsylvania is said to be the last for that part of the state, (1) a bird also immature is in my collection taken in December 1888, at Montreal, Quebec; there are other Montreal records of the same date (2) but with the exception of one taken at Tadousac, July 20, 1889, (3) these are last Quebec records of birds actually taken. In Ontario two were taken at Toronto in 1890, on September 20, and October 11, both immature females, the latter is in my collection, as is an adult female taken by Mr. Walter Brett, at Riding Mountain, Man., May 12, 1892, one of a pair seen. I also have an adult male taken at Waukegon, Ill., Dec. 19, 1892. I was in New York in the latter part of Nov. 1892 and was then assured by Mr. Rowland, a well known taxidermist, that he had recently seen several barrels of pigeons that had been condemned as unfit for food, they had come to New York from the Indian Territory (4) and I believe had had their tails pulled out to permit of tighter packing. Mr. Wm. Brewster has recorded the sending of several hundred dozens of pigeons to the Boston market in December of the same year, and in January, 1893; these were also from Indian Territory; these are the last records we have of the passenger pigeon as any thing more than a casual migrant. The

(1) Proceedings of the Delaware Valley Ornithological Club, II, 1898, 17.

(2) Wintle, Birds of Montreal, 1896, 51.

(3) In collection of Dr. J. Dwight, Jr.

(4) Minot, Birds of New England, 1895, 395.

records ceased after this till 1898 when three birds were taken at points widely apart, an adult male at lake Winnepegosis, Man., on April 14, (5) an immature male at Owensboro, Kentucky, on July 27, now in the Smithsonian Institution, and another immature bird taken at Detroit, Michigan on September 14 (5) is in my collection, these are the last records that can be based on specimens. (6)

In 1903, I published a list (5) including sight records one as late as May 1902, this latter is possibly open to doubt, but the ones I gave for 1900 are, I feel confident, correct, as the birds were seen more than once and by different observers. For all practical purposes the close of the nineteenth century saw the final extinction of the passenger pigeon in a wild state and there remained only the small flock, numbering in 1903 not more than a dozen, that had been bred in captivity by Prof. C. O. Whitman of Chicago. These birds the descendants of a single pair, had long before that ceased to breed and it was in an effort to obtain fresh blood for this flock that I started a newspaper enquiry that brought many replies none of which could be substantiated as records of the passenger pigeon and many referred to the mourning dove. I am aware that there has been lately widely spread and persistent rumours of the return of the pigeons, but no rumour has borne investigation, and I feel that Prof. Whitman's small flock now reduced in 1906 to five birds are the last representatives of a species around whose disappearance mystery and fable will always gather.

(5) Auk, XX, 1903, 66.

(6) There is a mature female in the collection of the Carnegie Institution of Pittsburg Pa. marked "Pennsylvania" August 15th 1898 but without further locality.

CORRESPONDENCE.

London, Ont., Thursday, Feby. 14, 1907.

To the Editor of the Ottawa Naturalist:

In your issue of May, 1902, I published a notice of the capture of the Longtailed Jaeger at Rondeau. Mr. J. H. Fleming, Toronto, inquired from me about this bird, stating that it was probably the Parasitic Jaeger, not the Longtailed. After a good deal of correspondence with him and study over the matter I met him recently in Toronto and we went over all the specimens carefully together and as a result I am convinced that he is quite correct and that all the characters upon which stress is laid in the books for the separation of these two species are unreliable.

My birds answer to these characters but the important point which is not mentioned in any of the American books is the color of the primary shafts, the Parasitic Jaeger having white shafts throughout and the Longtail having only the first two or three white and the rest dark.

All the remaining characters seem to vary with individuals to such an extent that they become absolutely worthless for diagnosis. Mr. Howard Saunders, London, England, who is considered the great living authority on the gull family, supplied Mr. Fleming with his information and after the careful examination which he and I made of all the available matter, I am not only satisfied that Mr. Fleming is correct but feel that he should be congratulated on such careful work. When the authorities make mistakes it takes exceptional care to find it out.

W. E. SAUNDERS.

NOTES ON SOME FRESH WATER SHELLS FROM
MANITOBA.

— — —
By J. F. WHITEAVES.

In June, 1906, Professor Macoun collected a few fresh water shells at two localities in Manitoba. The species represented in these collections are as follows, those to which an asterisk is prefixed having been kindly determined by Dr. V. Sterki.

A. *From a small lake four miles and a half due west of Hamiota.*

PELEGYPODA.

**Sphærium (Musculium)* allied to *S. securis*, Prime.

Several specimens.

**Pisidium Roperi*, Sterki.

Several specimens.

GASTEROPODA.

Segmentina (Planorbula) Christyi, Dall.

Six adult and perfect, but dead specimens. This species, which was first described and figured by Dall in 1905, in volume xiii of the "Harriman Alaska Expedition" Reports, was based upon seven specimens, from "High Bluff, Manitoba, (R. Miller Christy)" and "Fort Smith, Mackenzie River (E. A. Preble)," in the United States National Museum. The small lake from which Professor Macoun collected his specimens, is about 104 miles west of High Bluff.

Planorbis (Torquis) parvus, Say.

Ten specimens.

Physa gyrina? Say.

Four very young specimens.

B.—From a small lake in the sand hills west of Pine Creek,
and north east of Carberry.

PELECYPODA.

**Pisidium Roperi*, Sterki.

Several specimens.

**Pisidium variabile*, Prime.

Several specimens

**Pisidium medianum*, Sterki.

Four specimens.

**Pisidium ventricosum*, Prime.

Several specimens.

**Pisidium noveboracense*, Prime, var.; (or near).

Three specimens.

**Pisidium*, resembling *P. milium*, Held.

Several specimens.

**Pisidium*, near *P. pauperculum*, Sterki.

Several specimens.

GASTEROPODA.

Planorbis (Menetus) exacutus, Say.

Several specimens.

Planorbis (Armiger) crista, L.

One specimen, since broken.

Ottawa, Feb. 9th, 1907.

METEOROLOGICAL OBSERVATIONS.

1907]

METEOROLOGICAL OBSERVATIONS.

Taken at the Central Experimental Farm, Ottawa. Maximum, minimum, and mean temperature for each month, with date of occurrence, also, rainfall, snowfall, and total precipitation, in 1906.

MONTH.	Mean of Maxima.	Mean of Minima.	Range of Means.	General Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation	Number of days Precipitation	Heaviest in 24 hours.	Date.
January	28.68	10.17	18.51	19.92	48.0	23	-14.4	10	0.26	9.25	1.18	14	0.35	18
February	25.18	3.26	21.92	14.22	46.0	21	-21.8	2	0.66	7.75	1.43	12	0.50	14, 25
March	30.83	12.87	17.96	21.85	47.0	29	-3.2	24	0.98	7.50	1.72	10	0.92	27
April	54.20	34.85	22.68	46.19	71.6	19	17.0	7	0.78	1.75	0.95	12	0.29	10
May	64.94	40.14	24.80	52.54	89.8	18	28.8	11	1.88	.....	1.88	15	0.45	25
June	77.83	53.96	23.87	65.89	89.0	15 & 20	36.6	12	4.85	.....	4.85	18	1.05	8
July	82.34	56.04	26.29	69.18	93.6	22	44.2	5	1.58	.....	1.58	8	0.62	30
August	84.04	57.07	26.96	70.55	96.6	19	43.5	15	2.43	.....	2.43	9	0.74	20
September	75.86	47.86	28.00	61.86	92.0	12	32.2	25	2.53	.....	2.53	7	1.56	29
October	56.42	35.86	20.55	46.13	75.8	4	24.5	12	3.56	.....	3.56	10	1.22	6
November	38.28	23.87	14.40	31.07	50.0	2	7.4	15	1.01	7.75	1.78	11	0.61	26
December	20.70	3.23	17.46	11.96	38.0	15	-25.2	8	0.84	21.75	3.01	19	0.55	6
									21.36	55.75	26.90	145		

Rain or snow fell on 145 days during the 12 months.

Heaviest rainfall in 24 hours, 1.56 inches on September 29th.

Heaviest snowfall in 24 hours, 5.50 inches on December 6th

The highest temperature during the 12 months, was 96.6 on August 19th.

The lowest temperature during the 12 months, was 25.2 on December 8th.

During the growing season rain fell on 12 days during April, 15 days in May, 18 days in June, 8 days in July, 9 days in August, and 7 days in September.

September shows the lowest number of days with precipitation, viz., 7.

Total precipitation during the 12 months, 26.90 inches, as compared with 32.42 inches during 1905.

RAINFALL, Snowfall, and Total Precipitation from 1890 to 1905, also, the Total and the Yearly Average Precipitation for the 17 years.

YEARS.	Rainfall.	Snowfall.	Total Precipitation
1890.....	24.73	64.85	31.22
1891.....	30.19	73.50	37.54
1892.....	23.78	105.00	34.28
1893.....	31.79	72.50	39.04
1894.....	23.05	71.50	30.20
1895.....	27.01	87.50	35.76
1896.....	21.53	99.75	31.50
1897.....	24.18	89.00	33.08
1898.....	24.75	112.25	35.97
1899.....	33.86	77.25	41.63
1900.....	29.48	108.00	40.27
1901.....	29.21	97.25	38.91
1902.....	25.94	101.75	36.10
1903.....	26.43	85.00	34.92
1904.....	25.95	108.75	36.79
1905.....	23.71	87.25	32.42
1906.....	21.36	55.75	26.90
Total for 17 years	446.95	1496.85	596.53
Yearly average for 17 years..	26.29	88.05	35.09

RECORD OF SUNSHINE FOR THE YEAR 1906.

MONTH.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
January.....	20	11	87.5	2.82
February.....	21	7	132.3	4.72
March.....	22	9	163.7	5.28
April.....	27	3	200.8	6.89
May.....	26	5	201.8	6.50
June.....	28	2	224.0	7.46
July.....	31	0	272.4	8.80
August.....	31	0	273.7	8.82
September.....	29	1	215.8	7.19
October.....	25	6	138.5	4.47
November.....	19	11	95.8	3.19
December.....	20	11	72.6	2.34

WILLIAM I. ELLIS, *Observer.*

ENTOMOLOGICAL BRANCH.

Meeting No. 3, held at Mr. W. Simpson's house, Jan. 24, 1906: ten present. At the request of Mr. Simpson, Dr. Fletcher acted as Chairman.

Mr Harrington gave an account of the chief characteristics of the Lampyridæ, reading extracts from Dr. Sharpe's article on the subject in the Cambridge Natural History. The phenomenon of luminosity was discussed and several present spoke of having observed this in larval forms. The different groups were considered, and Mr. Simpson exhibited his collection in which most of the Ottawa species were represented. Mr. Harrington read extracts from an article in the January "Entomological News" by Dr. W. A. Riley, giving an account of the remarkable process of polyembryony of *Litomastix truncatellus* as discovered by Prof. Filippo Sylvestri, of Portici, Italy. A most striking feature of this process is that from a single egg there originate in the parasitized larvæ over a thousand individuals of two different types of larvæ, one thousand being of the normal form; and in addition there are about one hundred vermiform asexual larvæ, which lack all trace of circulatory, respiratory, or genital systems or of malpighian tubes. They are, however, provided with strongly developed mouth parts adapted for tearing, and their special function seems to be the breaking down of the organs of the parasitized caterpillar and thus preparing them to serve as nutriment for the sexual forms.

Mr. Gibson exhibited a case containing complete series of inflates illustrating the life histories of *Gluphisia severa*, *Smerinthus cerysii*, var. *ophthalmicus*, and *Crocigrapha normani*, all of which had been reared from the egg, and larvæ preserved of each stage. Mr. Gibson also read a short article on the Great Leopard Moth, *Ecpantheria deflorata*.

Mr. Young showed a case of 130 different species of geometridæ which he had taken at Ottawa and specimens of all of which had been through the Rev. G. W. Taylor's hands for identification. The most interesting species were pointed out and some facts of their occurrence stated.

Mr. Keele gave an account of his last summer's work in the Klondike country proper, which he explained was not as good a locality for insects as that where he was working in 1905. He showed some most interesting photographs of the country and of animals, which had been taken during the expedition. Some pictures of Dall's Big-horn, a cow moose protecting her two calves, a Canada Lynx, a percupine, and a group of ptarmigan on a mountain side, were much admired. Mr. Keele related some interesting incidents with regard to each picture.

Mr. Nelles, of the Alaska Coast Strip Survey, explained the nature of the country where he was working last summer. A large number of insects had been taken by Mr. Theo. Bryant, an enthusiastic entomologist who was one of the party.

Mr. Baldwin showed the galls of *Eucosoma scudderiana*, a common gall on the Canada Goldenrod, and also the moths, and several parasites. Dr. Fletcher spoke of the checkered history of this species, which by mistake was thought to have been reared by Walsh from willow galls and was originally described under the specific name *saligneana* for this reason. It had been referred to two or three genera at different times but was for the present resting in the genus *Eucosoma*. Mr. Baldwin also exhibited a large specimen of the West Indian Spider usually spoken of as the Banana Tarantula, on account of the frequency with which it is introduced with bunches of that fruit.

Mr. Simpson showed living specimens of the small red lady-bird beetle, *Adalia bipunctata*, and spoke of the enormous abundance of these insects at the present time in the Dominion Astronomical Observatory and during the past summer on the Experimental Farm. This was attributed to the great abundance of plant lice of all kinds in the early part of the season, the lady-bird beetles feeding upon the plant lice and performing a most useful part in the balance of nature. Soon after midsummer it was noticed that the pupæ of the *Adalias* were infested by minute hymenopterous parasites to such an extent that probably not more than two or three per cent of the pupæ produced beetles.

Dr. Fletcher showed a photograph by Mr. E. A. Carew.

Gibson, of oak trees in the vicinity of Victoria, B. C., which were draped with the silken webs of *Ellopiia somnaria*, the Vancouver Island Oak-looper. This photograph was taken in the evening, and the defoliated trees were so hidden by webs made by the caterpillars when letting themselves down from the trees to pupate, as to give the appearance of being looked at through a fog. Specimens of the larvæ and moths were also shown. A paper by the Rev. G. W. Taylor, on some geometers taken at Ottawa between May 24 and June 2, was read, and also a paper by Mr. W. T. Ellis, giving a résumé of the Meteorological Observations taken at the Central Experimental Farm, Ottawa, during 1906. Both of these papers were prepared for the Ottawa Naturalist. J. F.

No. 4, held on Thursday, Feb. 7, 1907, at the residence of Mr. Harrington.

Present:—Messrs. Halkett, Gibson, Fletcher, Eifrig, Baldwin, Young, Metcalfe and Harrington.

Rev. Mr. Eifrig exhibited some lepidoptera from Indiana, consisting of six species of butterflies, including *Papilio ajax*, var. *marcellus*, *Terias nicippe*, and two species of moths. He also showed pupa cases of one of the large dragon flies (*Cordulia* sp.) and also a number of specimens of ants, *Camponotus pictus*, from the stomach of a Pileated Woodpecker shot at Eganville. Dr. Fletcher stated that he had examined the contents of the crop of a ptarmigan, for Mr. Eifrig, and found them to consist entirely of the tips of twigs of willows.

Mr. Baldwin exhibited a box of lepidoptera captured the previous summer, containing 24 species, among which were *Grapta faunus*, *Caripeta divisata*, *Nisoniades lucilius*, *Pamphila metacomet*, *Crambus agitatellus* and *Leucania phragmatidicola*.

Dr. Fletcher showed a small collection of butterflies made by Mr. Lawrence M. Lambe of the Geological Survey, near Kamloops, B. C. Of the five species secured, one fritillary was apparently a new species found by Mr. C. DeBlois Green of Osoyoos, B. C., some years ago but not yet described. He also exhibited an example of the Riker method of mounting insects in glass-topped boxes; the specimens illustrated being *Limneria Guignardi*, Prov., bred from *Ædemasia concinna*, and a spruce twig showing the characteristic galls of *Chermes abietis*, which

had been very abundant for the past two seasons in Western Ontario.

Mr. Halkett read an extract from Wallace on variability in insects, which lead to some discussion on the well known mimicking of certain butterflies by others of different genera.

Mr. Metcalfe reported that he was continuing his work of preparing a list of hemiptera of the locality and exhibited a few species including a very young *Ranatra* and a winged example of *Coriscus subcoleoptratus*. He also exhibited a female *Prionus Californicus*, which was taken by him on July 31, 1905, at Grierson's Wharf on the Ottawa River about 25 miles from Ottawa. The insect was in flight when observed and captured. It was suggested by Mr. Harrington that the beetle must have come east on one of the train of the C. P. R., which runs down along the Ottawa river. The specimen was compared with examples from Vancouver Isd. and seemed to be identical.

Dr. Fletcher drew special attention to a curious beetle, received from Mr. J. W. Cockle, of Kaslo, B. C., in a box of very interesting coleoptera, but was unable to furnish the name, as even the genus was unknown to him and to Mr. Harrington. It was thought to belong to the Cupesidæ, as it had many of the characteristics of that family.

Mr. Gibson, showed a good example of the work of a *Megachile*, the Rose-leaf-cutter Bee, in which several of the cells were visible. He also spoke of a collection of lepidoptera which had been determined for Mr. John Russell, of Digby, N. S. Among the most interesting specimens were the following:—*Thecla læta*, *Semioophora youngii*, *Mamestra rubefacta*, *Hadena minuscula*, *Hadena bridghami*, *Catocala cælebs* and *Grapta satyrus*, var. *marsyas*. A specimen was also exhibited of the Lesser Magpie Moth, *Eurrhypara urticata*, collected at Milton, N. S., by Mr. W. H. Moore. This was the first American record for this European insect, which was stated by Dr. Fletcher to have been also taken by Mr. W. McIntosh at St. John, N. B., where it was not uncommon.

Mr. Young exhibited Vol. VI of Sir George Hampson's catalogue of the Phalænæ in the British Museum. The exquisite plates accompanying the volume were much admired by the members and were specially interesting from the many moths figured which had been found in Canada. A large number credited to Colorado in this volume have also been taken in Manitoba, the North-west Provinces and British Columbia. Several of the members availed themselves of the opportunity of examining Mr. Harrington's collections and entomological library.

W. H. H.

NATURE STUDY, No. XLII.

THE RELATION OF SPARROWS TO AGRICULTURE.

By L. H. NEWMAN, B.S.A., Ottawa.

The relation of Sparrows, as a Class, to Agriculture is very little known, and people have some very erroneous ideas regarding this relationship.

In the first place, the fact that there are several species of sparrows in this country, is known by comparatively few, and thus the inroads committed by the numerous English Sparrows upon our garden and field crops condemn, to a large degree, the whole class.

Now it is evident that a group of birds so abundant, so widely distributed, and in such constant association with farms and gardens must play an important part in rural economy, and that a through investigation of their food habits would be useful. The results of such an investigation are embodied in this paper and amply demonstrate the value of the different birds to the agriculturists.—“A value”, says Judd, “greater than that of any other group of birds whose economic status has thus far been investigated.”

In order that the different kinds may be easily distinguished, and thereby to assist in preventing the reckless slaughter of beneficial species in mistake for the more injurious English Sparrows, I shall give the chief characteristics of some of the common birds which are known generally as Sparrows.

The following species are common in all parts of Ontario: the English Sparrow; the Chipping Sparrow; the Vesper Sparrow; and the Song Sparrow.

ENGLISH SPARROW (*Passer domesticus*).

The well-known English, or House Sparrow, is found in almost all parts of the United States and Canada. There is a marked difference in the appearance of the males and females but both are well known to all. The note of these birds is anything but musical.

Throughout its range, the English Sparrow abounds chiefly in towns and villages, along roadsides, and about farm buildings, it is seldom found in the open fields, except during the harvest.

The spot chosen for the nest is some hole or crevice in a wall or chimney. Sometimes it is built in tree tops. The nest is very

bulky, and is composed largely of straw and grass. The interior is lined with feathers and other soft material.

The eggs vary in number from four to six, are grayish-white in colour, and are more or less covered with oblong grayish black spots.

CHIPPING SPARROW (*Spizella socialis*).

The Chipping Sparrow is the smallest of all our Sparrows, and may be easily recognized by its red-capped head, a conspicuous light stripe over the eye, and its slate-coloured breast. It may also be identified by its incessant metallic chirp, as it hops about in the grass or hedge-rows, looking for seeds and insects, as well as by its monotonous little song chippy-chippy-chippy, many times repeated.

This species is plentiful in Ontario. The female builds its neat little home in low trees near the habitation of man, and, in fact, often in the vines on his porch. The nest is constructed of grass and is beautifully lined inside with horse hair. The eggs are of a delicate robin's-egg blue, spotted at one end with dark purple. There are two broods of from two to five each year.

VESPER SPARROW (*Poocætes gramineus*).

The Vesper Sparrow is abundant throughout all parts of North America. Fields, grassy hillsides, and open valleys are its places of resort. It is a shy, timid little bird, resembling to a considerable extent the Song Sparrow; but is of grayer brown with a bay-brown patch on each shoulder and the outside feathers of the tail white. It is also known as the Bay-winged Bunting, Ground Bird and Grass Finch. In winter, according to Nuttall, these birds flock together in great numbers in the Southern States; and, mingling with other species, line the roadsides and straggling bushes near the plantations. But no sooner does early spring arrive than they seek out again their nesting regions of the Northern States and Canada. When disturbed, they flit up from the ground, spread their white-bordered tails, and alight a short distance away, to resume their work. This trait is sufficient to identify this species. Their characteristic, attractive song may also be heard during the summer, especially in the late afternoons and evenings.

The female builds her nest on the ground, sheltered by some grassy tuft. The four to six eggs are of a grayish-white, thickly covered with dull, reddish-brown spots.

SONG SPARROW (*Melospiza melodia*).

The Song Sparrows is one of our earliest summer visitor to

appear in the spring, and it is fitting that this, one of our most musical birds, should be so called. Its bright, canary-like lay is one of the most attractive voices of the spring, and is familiar to many who do not know the identity of its author. In habit, it differs from the Chipping Sparrow,—it is not so often met with in the open country or in the garden, but is generally found inhabiting the borders of rivers, meadows, swamps, and other watery places. I have found it, however, in company with the English Sparrows hopping about the barnyard. It seeks its food on the ground, hopping along through grass and weeds in a peculiar, mouse-like manner.

It is a plump little bird, with dark-brown streaks over its head, and along its sides. The breast is light in colour, boldly streaked with dark-brown and with a conspicuous dark patch in the centre. The beak is stout and dark-coloured. The Song Sparrow resembles the Vesper Sparrow considerably; but is much darker and of a ruddier brown. Its tail is longer and lacks the two white feathers which are such a striking feature of the Vesper Sparrow.

The female generally builds her nest on the ground in a little elevated tuft of grass, or other vegetation. It is composed of fine, dry grass, and is lined with horse-hair and other material. It lays four to five eggs of a bluish-white colour, thickly covered with large reddish-brown spots.

ECONOMIC VALUE OF SPARROWS.

Some years ago in an effort to arrive at the true relation of these common birds to agriculture, I undertook a rather extensive investigation of the food consumed by the four above named sparrows during one summer. For this purpose of course it was necessary to kill a few specimens each week, throughout the summer, and a most careful examination was made of the stomach, the crop and the gullet of each. From this investigation the following conclusions were drawn regarding the economic importance of each species.

The English Sparrow is almost exclusively a grain and weed-seed eater. Nearly all the insects found in the stomachs of those examined were of a kind practically neutral in their effects on Agriculture.

Now, although it is true that they consume a considerable amount of weed-seeds, yet the fact that they limit their weed-seed eating largely to the barnyard and the immediate vicinity of buildings, lessons to a great degree the benefit which they would otherwise confer upon the farmer.

During harvest, when they can get grain easily, they leave the shelter of buildings and, by thousands, pillage the fields, causing great damage. At this time, very few weed-seeds were found in their stomachs, grain being evidently preferred to weed-seeds when available.

It appears, therefore, that there is little to be said in favour of the English Sparrow. Its weed-seed eating habits are creditable, as far as they go, but they are insignificant because the damage done to grain far overbalances the benefit derived from weed-seed destruction. Adding to this the injury it does about buildings by its filthy habits, and the fact that it drives away other birds beneficial in their habits, there is no escape from the conclusion that this bird is a serious pest, the extermination of which would be an unmixed blessing.

The Chipping Sparrow is not so well known generally as the English Sparrow, but is of much greater benefit to the farmer. Much service is rendered in destroying weed-seeds, but the greatest utility of the species is shown in its animal food, the greater part of which consists of noxious insects. Practically no grain was found in the stomachs examined, although the birds were shot in grain-fields. This, therefore, proves conclusively that they are not injurious to our grain crops.

The Vesper Sparrow, like the Chipping Sparrow, is also very beneficial. Its diet varies with the season. During spring and Fall, when insects are scarcer, its food consists to a large extent of weed-seeds, but during the summer months, its work as a destroyer of injurious insects is very great, measured by the sparrow standard.

Unlike the English Sparrow, it feeds farther out in the field, and hence the weed-seed consumption is a direct benefit. Its value to the farmer is beyond question, and should secure for it the fullest protection. It may be easily distinguished from the injurious English Sparrow by the 2 white feathers in the tail, and it is hoped that people will soon learn to distinguish these two birds, and thereby save many of these useful little songsters from an untimely death.

The Song Sparrow also, taking the food habits as a whole, this bird does much more good than harm, and is worthy of protection and encouragement. Its food is composed chiefly of insects, the greater part of which are injurious; it is, however, also a weed-seed destroyer, particularly in autumn. .

Experience has also shown that while this bird will not refuse grain during harvest, yet the injury caused in this way is inconsiderable.

INDEX

TO THE

OTTAWA NATURALIST, VOL. XX, 1906-7.

	PAGE		PAGE
Ami, H. M., Notes on Fossil Fruits from Vermont	15	Chemistry, The Foundations of, as seen in Nature Study....	89
Anderson, J. R., Curious Natural Freak	81	<i>Chrysanthemum Leucanthemum</i> , L.....	55
Animal Coloration	153	Coloration, Animal	153
Antennarias, Some Canadian ..	72	Council, Report of	7
<i>Araucaria Louisianna</i> , Farr ..	109	Criddle, Norman, The Golden-winged Warbler in Manitoba	112
Bather, F. A., The Species of <i>Botryocrinus</i>	94	An Addition to our Manitoba Warblers.....	189
Beluga, Notes on the Skeleton of a	214	Crow, A Sagacious	49
Bird Migration on Sable Island, 1905.....	127	Cryptogamic Flora of Ottawa ..	177
Birds, A May Morning with	22	<i>Cyrloceras cuneatum</i> , Notes on..	134
Migration of	33	Duck Island, A visit to	187
Records of rare in Maritime Provinces	88	Dunlop, Geo. A., Note on a Partridge	216
Some notes on winter... ..	216	Eifrig, C. W. G., Migration of Birds	33
The Spring Migration of, at Ottawa compared with other seasons ..	144	Some notes on Winter Birds ..	217
Botany, Contributions to Canadian	35, 1	The Connecticut <i>vs.</i> the Kentucky Warbler	78
<i>Botryocrinus</i> , The Species of ..	127	The Great Gray Owl	79
Boutelier, James, Bird Migration on Sable Island in 1905	127	The Spring Migration of Birds at Ottawa compared with other years.....	144
Bradshaw, Geo. H., A Swarm of Butterflies	212	Ellis, Wm., Meteorological Observations	241
Brittain, John, The Foundations of Chemistry as seen in Nature Study	89	Elliott, Robt., Extracts from the Diary of	120
Brown, W. J., Richardson's Merlin	112	Emperor Moth, The Cecropia ..	149, 189
Prairie Horned Larks... ..	40	Entomological Branch, Report of ..	82
Butterflies, A Swarm of	212	Reports of Meetings	129, 202
Caribou of Queen Charlotte Islands	73	Entomological Society of Ontario	171
Cement Sidewalk, A	45	Eriophorum, The Ottawa Species of	41
		<i>Eriophorum Chamissonis</i> and <i>E. russeolum</i> , The identity of..	62

	PAGE		PAGE
<i>Eriophorum russeolum</i> vs. <i>E. Chamissonis</i>	62	Infusorial Earth near Lake Windeonere, B.C.	205
<i>Eupithecia Fletcheri</i> , Description of.....	200	Ivy Poisoning and its Treatment	77
Excursions, Report of 43, 66, 86, 223		Jaeger, Long-tailed.....	238
Farr, Edith M., Some new Plants from the Rockies and Selkirk	105	Parasitic	238
Fernald, M. L., The Identity of <i>Eriophorum Chamissonis</i> and <i>E. russeolum</i>	62	Johnston, J. A., The Chambord Meteorite	51
Field Sparrow, Note on.....	113	Kells, W. L., Nesting of Wilson's Snipe	55
Fishes, some Curious Facts about	229	Land Shells, Notes on, from British Columbia	115
Fleming, James H., Note on the Fulvous Tree Duck in British Columbia	213	Larks, Prairie Horned	40
The Disappearance of the Passenger Pigeon	236	Latchford, F. R., Note on <i>Limnaea megasoma</i>	172
Fletcher, James, Fruit and Seed School Exhibits of Pressed Plants	173	A Visit to Duck Island	187
Fossil Fruits from Vermont	15	<i>Limnaea megasoma</i>	172
Fresh-water Shells, Notes on, from British Columbia.....	115	Lochhead, W., Agencies for Promotion of Nature Study in Canada	193
Notes on, from Manitoba	239	Lyell Medal, The Year's Award of	220
Notes on, from Ontario and Keewatn	29	Macoun, James M., Contributions to Canadian Botany....	135, 162
Freak, Curious Natural	81	Ivy Poisoning and its Treatment.....	77
Fruit and Seed, Definition of.....	161	Note on <i>Spergula arvensis</i>	24
Fulvous Tree-duck	188	Note on <i>Chrysanthemum Leucanthemum</i>	55
In British Columbia.....	213	The Ottawa Species of <i>Eriophorum</i>	41
Garden, The Galt Park Wild-flower	67	Macoun, John, The Cryptogamic Flora of Ottawa—Musci.....	177
Garrett, P., Notes on the Eggs of the Solitary Sandpiper	53	Manual Training	207, 225
Gallup, Asa, A Sagacious Crow.	49	Maughan, John, Cecropia Emperor Moth	189
Gibson, Arthur, The Cecropia Emperor Moth	149	Note on the "Teal Weed" of St. Clair Flats	190
Golden-winged Warbler in Manitoba	112	McEllinney, Mark G., The Mechanical Hobby	207
Greene, Ed. L., Some Canadian Antennarias	72	Manual Training—The Machinists Art.....	225
Halkett, A., Some Curious Facts about Fishes	229	McCreedy, S.B. A Cement Sidewalk	45
Hamilton, R. S., The Galt Park Wildflower Garden	67	Members, List of	4
<i>Hieracium Albertinum</i> , Farr.....	109	Merlin, Richardson's	111
Holm, Theo., On the Structure of Roots	18	Meteorite, The Chambord.....	51
<i>Eriophorum russeolum</i> , vs. <i>E. Chamissonis</i>	62	Meteorological Observations at Ottawa	241
		Migration of Birds	33
		At Ottawa in Spring of 1906 as compared with other years..	144

	PAGE		PAGE
Moore, W. H., A May Morning with the Birds of New Brunswick	22	Shells—Continued.	
Records of Rare Birds in the Maritime Provinces	88	Notes on some Fresh-water from Manitoba	239
Moth, The Cecropia Emperor 149, 189		Sidewalk, A Cement	45
Musci, Ottawa	177	Sinclair, N.B., Definite Problems in Nature Study	25
Nature Study, Agencies for Promotion of, in Canada	193	Snipe, Nesting of Wilson's ...	53
Definite Problems in	25	Soirées, Programme of	192
Papers, 25, 45, 67, 92, 114, 149, 173, 193, 209, 225, 247		Reports of	222
The Foundation of Chemistry as seen in ..	89	Sparrow, Note on Field	113
New Brunswick, A May Morning with the Birds of	22	Early Nesting of Vesper	32
Newman, L. H., The Relation of Sparrows to Agriculture..	247	Sparrows, Relation of, to Agriculture	247
Owl, The Great Gray	70	<i>Spergula arvensis</i> , L.	24
Partridge Caught in Ice Crust..	216	Spreadborough, W., Note on Fulvous Tree-duck ..	188
<i>Pachystima Krautteri</i> , Farr ...	108	Taylor, Gao. W., Description of <i>Eupithecia Flecheri</i>	200
<i>macrophyllum</i> , Farr	107	Teal Weed of St. Clair Flats, Note on	190
<i>Myrsinites</i> , Raf	107	Treasurer's Statement	14
<i>Schaefferi</i> , Farr	108	Vesper Sparrow, Early Nesting of	32
Pigeon, The Disappearance of the Passenger	236	Warblers, An Addition to the Manitoba	189
Plants, School Exhibits of Preserved	173	Warbler, The Connecticut <i>vs.</i> the Kentucky	78
Some new from the Rockies and Selkirks	105	The Golden-Winged in Manitoba	112
Prairie Horned Larks	40	Whale, Notes on the Skeleton of a White	214
President's Address	198	Whiteaves, J. F., List of Fresh-water Shells from Ontario and Keewatin ..	29
Prince, Ed. E., Animal Coloration	153	Notes on some Fresh-water Shells from Manitoba	239
Programme of Winter Soirées ..	192	Notes on Land and Fresh-water Shells from British Columbia	115
Reviews	44, 114, 132, 191	Notes on <i>Cyrtoceras cuneatum</i> ..	134
Richardson's Merlin	111	Notes on the Skeleton of a White Whale	214
Roots, On the Structure of	18	Wildflower Garden, The Galt Park	67
Sable Island, Bird Migration on.	127	Wilson, W. J., President's Address ..	198
Sandpiper, Notes on the Eggs of the Solitary	52	Wilson's Snipe, Nesting of ..	53
Saunders, W. E., Note on Field Sparrow	113	Zoological Report	56
Note on Long-tailed and Parasitic Jaegers	238		
Shells, List of Fresh-water from Ontario and Keewatin	29		
Notes on some Land and Fresh-water from British Columbia	115		

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